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WIANT (J. S.) & TUCKER (C. M.). **A rot of Winter Queen Water-melons caused by Phytophthora capsici.**—*J. agric. Res.*, ix, 2, pp. 73–88, 5 figs., 2 graphs, 1940.

A rot of Winter Queen watermelons grown in Colorado was observed on the New York City market in 1935 and 1936 (but in none of the consignments received during 1937 and 1938), affecting from 5 per cent. or less to nearly all of the melons. The causal organism was identified as *Phytophthora capsici* [cf. *R.A.M.*, xix, p. 254]. In culture it had optimum, maximum, and minimum temperatures of 80° to 85°, 95° to 100° (for growth in four days), and 45° to 47·5° F., respectively. No growth occurred at 45° in 19 days. Maximum decay development in inoculated fruits occurred at 85°; at 63° to 70° lesions attained a diameter of 45 to 79 mm. in four days; at 50° old lesions continued to enlarge slowly, but new lesions were not apparent in 14 days; and at 45° no decay developed in 14 days. The fungus was experimentally found to penetrate the apparently unbroken rind of Winter Queen watermelons. The results of several tests showed that under favourable temperature conditions the decay can readily spread within the container from diseased to healthy melons. The fungus proved to be capable of infecting unwounded fruits of pepper [*Capsicum annuum*], tomato, apple, cantaloupe, cucumber, and squash, and roots of carrot, and also wounded orange and lemon fruits and potato tubers. It is suggested for the control of the rot that reduction of carrying temperatures to 50° would materially retard decay and that maintenance of a temperature of 45° would completely arrest decay during the transit period.

SINHA (S.). **On the characters of Choanephora cucurbitarum Thaxter on Chillies (Capsicum spp.).**—*Proc. Indian Acad. Sci.*, Sect. B, xi, 4, pp. 162–166, 10 figs., 1940.

The author presents some observations on the causal organism of chilli wet rot (*Choanephora cucurbitarum*) [*R.A.M.*, xv, p. 280] in the Lucknow district of India supplementary to those recorded by J. F. Dastur (*Ann. Bot., Lond.*, xxxiv, pp. 399–403, 1920). Contrary to the experience of the latter, and also of F. A. Wolf, who described the same fungus on squash in the United States (*J. agric. Res.*, viii, pp. 319–328, 1917), the zygospores developed as well from conidia derived from cultures (on Brown's medium in this instance) as directly from the host. Another point of difference consists in the production of sporangia on

the host (as already recorded by Palm and Jochems for the fungus on *Amaranthus blitum* [*R.A.M.*, iv, p. 254]), and not only in culture, where they occurred both in company with and apart from conidia. Like Wolf, the writer detected diminutive sporangia among those of normal dimensions; in the present case there was a corresponding reduction in the size of the columella, which in fact was occasionally absent from sporangia so minute as to accommodate only a single spore. Variations from the normal course of conidiophore development, as already reported by Wolf, were similarly noted by the writer, the conidia sometimes arising directly from the surface of primary heads.

SINHA (S.). **A wet rot of leaves of Colocasia antiquorum due to secondary infection by Choanephora cucurbitarum Thaxter and Choanephora trispora Thaxter sp. (=Blakeslea trispora Thaxter).**—*Proc. Indian Acad. Sci.*, Sect. B, xi, 4, pp. 167–175, 29 figs., 1940.

During the rainy season of 1938 the foliage of *Colocasia antiquorum* in the Lucknow district of India was observed to be infected by *Choanephora cucurbitarum* [see preceding abstract] and *Blakeslea trispora*, occurring either separately or in conjunction with *Phytophthora colocasiae* [*R.A.M.*, xvii, p. 587]. The two first-named fungi induce a wet, pulpy rot and eventual collapse of the leaf blades, quite distinct from the blight due to *P. colocasiae*, and involving the petioles in severe cases. The first symptoms appear in August, coincident with the production of the conidia and sporangia of the fungi [see preceding abstract] in the lesions caused by *P. colocasiae*, and continue to spread, especially under very humid conditions, until late October.

The presence of conidia in *B. trispora* removes the supposed distinction between *Choanephora* and *Blakeslea*, on which the separation of the genera was based. It is therefore proposed to abolish the genus *Blakeslea* and transfer *B. trispora* to *Choanephora* as *C. trispora* (Thaxter) Sinha. Moreover, sporangiola, formerly regarded as peculiar to *Blakeslea*, have been observed in cultures of *C. trispora* on a synthetic nutrient medium containing potato starch.

LING (L.) & YANG (JUHWA Y.). **A mosaic disease of Rape and other crucifers in China.**—*Phytopathology*, xxx, 4, pp. 338–342, 2 figs., 1940.

Rape and other cultivated crucifers are stated to sustain considerable damage in various parts of China [*R.A.M.*, xviii, p. 607] from a mosaic disease characterized by symptoms similar to those described by Tompkins for turnips in New York [ibid., xviii, p. 223], consisting in the early stages of a conspicuous vein-clearing spreading from the leaf base upwards and later replaced by veinbanding and interveinal mottling. Curvature of the midrib and distortion of the lamina often accompany the above-mentioned features, the expression of which is favoured by low temperatures, while those exceeding 20° C. tend to mask them. Plants contracting infection at an early age are usually much stunted and often killed. Other hosts of the virus include turnip, Chinese cabbage (*Brassica chinensis*), leaf mustard (*B. juncea*), and Chinese radish (*Raphanus sativus* var. *longipinnatus*).

The mosaic virus was transmitted by sap from diseased to healthy

rape seedlings, using carborundum as an abrasive, in a low percentage of cases, the incubation period ranging from 18 to 26 days. In greenhouse experiments with *Myzus persicae* some 50 per cent. infection was obtained after 15 to 24 days' incubation. On Purple Top White Globe turnip the rape mosaic virus induces coarse vein-clearing, ruffling of the leaf, and prominent dark green mottling. Chinese cabbage develops a coarse, yellowish type of veinbanding, frequently accompanied by curvature of the midrib and stunting. Leaf mustard reacts by marked rugosity, foliar distortion, and severe stunting, while on Chinese radish the symptoms resemble those described for rape.

In rape extracts the virus was inactivated after six days at 11° to 13°, the thermal inactivation point for a ten-minute exposure in a water bath lying between 60° and 65°. Tolerance of dilutions up to 1 in 6,000 was established.

Despite similarities in the symptoms of rape and turnip mosaic, the host range serves to distinguish the two viruses, the former, for instance, being unable to infect cabbage and cauliflower. Only in New Zealand [ibid., xix, p. 509] and Germany [ibid., xvi, p. 10], moreover, has rape apparently been recorded as susceptible in nature, and in neither country do the symptoms or host range agree with those of the Chinese virus, which must therefore be regarded as a separate entity.

JENKINS (W. A.). **A new virus disease of Snap Beans.**—*J. agric. Res.*, lx, 4, pp. 279–288, 3 figs., 1940.

The new virus disease of snap beans (*Phaseolus vulgaris*) reported from Georgia [*R.A.M.*, xix, p. 2] was successfully transmitted by hypodermic injections of fresh juice from diseased pods in the snap bean stage and through viable seeds from diseased plants. Attempts to transmit the disease by insects have so far failed, with the one possible exception of the tarnished plant bug, *Lygus pratensis*, nor was it transmissible by grafting. The disease was observed on practically all the commercial bean varieties in the writer's variety trials and on several naturally infected dwarf Lima beans [*P. lunatus*].

JENNY (J.) & HUBER (H.). **Stationäre Spritzanlagen, namentlich für den Weinbau.** [Stationary spraying installations, especially for viticulture.]—*Annu. agric. Suisse*, xli, 2, pp. 171–185, 9 figs., 3 diags., 1940. [French summary.]

This is an expanded account of the electromotor stationary spraying plant in use at the Swiss Federal Station for Fruit-Growing, Viticulture, and Horticulture at Wädenswil for the control of vineyard parasites [chiefly downy mildew, *Plasmopara viticola*: *R.A.M.*, xvii, p. 158] and also applicable in the orchard. The technicalities and economics of the system are fully explained.

MAIER (W.). **Die Häufigkeit der Zellstäbe in den Internodien der Triebe reisigkranker Reben.** [The frequency of intracellular cordons in the shoot internodes of 'reisig'-diseased Vines.]—*Wein u. Rebe*, xxi, pp. 240–250, 1939. [Abs. in *Z. PflKrankh.*, l, 3–4, p. 221, 1940.]

The number of intracellular cordons in the shoots of 'reisig'-diseased Burgundy vines [*R.A.M.*, xix, p. 512] was found to be highest in the

basal (2nd to 7th) internodes, in which 1,694 were counted as against only 57 in the 8th to 30th. The formation of intracellular cordons and the shortening of the internodes on vine shoots were found to be quite distinct processes of independent occurrence. Intracellular cordons predominate in the internodes laid down the previous year and overwintering in the buds; hence short internodes and double nodes are mostly found in the first newly formed internodes of the current season's growth.

WILLIAMS (P. H.), OYLER (ENID), WHITE (H. L.), AINSWORTH (G. C.), & SELMAN (I. W.). **Plant diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1939*, pp. 28–38, 1940.

In this report [cf. *R.A.M.*, xviii, p. 783], P. H. Williams states that during 1939 two samples of mushrooms [*Psalliota* spp.] attacked by *Verticillium malthousei* [ibid., xvii, p. 374] were received at Cheshunt, from Buckinghamshire and Surrey, respectively. Fungi found in casing soil included species of *Corethropsis*, *Geotrichum*, and *Haplotrichum*.

Stem-burning of tomato plants, resembling the symptoms of *Phytophthora* foot rot [*P. cryptogea*] was caused by fumes from a powder containing cresylic acid dusted on to plants. Several thousand tomato seedlings placed in pots washed in water containing a cresylic acid compound were also killed off.

Tomatoes in Guernsey were found to be attacked by *V. albo-atrum* and *Fusarium bulbigenum* var. *lycopersici*.

I. W. Selman found a strain of tomato mosaic (single-virus streak group) which did not readily induce streak lesions on tomato plants. Attempts are in progress to investigate the possibility of introducing this virus (A 15) into crop plants as a 'vaccine'.

The chief cause of cucumber root rot at Cheshunt was ascertained to be an unsuitable physical condition of the soil. The killed and weakened plants are invaded by organisms some of which, such as *F. solani* and *F. orthoceras*, are weak parasites.

In further work on *Verticillium* wilt of chrysanthemums [ibid., xviii, p. 783] Miss Oyler inoculated stems of rooted cuttings of the susceptible varieties Cheshunt White and Favourite above soil-level with a culture of the fungus. Twenty cuttings were placed in various situations with mean temperatures ranging from 56° to 75° F. The results indicated that some degree of control may result if the plants are grown at higher temperatures than those generally used. Cultures of the fungus kept in an aqueous solution of malachite green (1 in 20,000) for 96 hours were killed, though higher concentrations were tolerated for shorter periods.

I. W. Selman states that outdoor varieties of chrysanthemum affected by 'reversion to parental type' showed discoloration, distortion, and dwarfing of the flowers, reduction of leaf size, and 'breaking' of the flower colours. White, yellow, and bronze varieties were affected, the last-named showing yellow streaks on the florets. A few leaves presented a faint chlorotic mottling. Inoculation tests revealed that all of the five affected varieties contained a virus of the cucumber virus 1 type, possibly hitherto undescribed. The fern-leaf symptom induced in tomato seedlings was not accompanied by reflexing of the leaf lamina. Glasshouse chrysanthemums from another locality showed

closely similar symptoms, the disorder being most marked in the variety Pink Favourite, in which about 2 per cent. of the stock was affected. So-called 'running-out' of chrysanthemum stocks is probably due to this virus.

Further observations by H. L. White on carnation wilt (*V. cinerescens*) [ibid., xvii, p. 459] indicated that plants raised from contaminated winter cuttings generally show disease symptoms the following summer; a clean stock may usually be obtained from plants segregated in pots and surviving until August and September. When carnations were potted in soil taken from positions recently occupied by affected plants no wilting occurred in five months in soil taken from depths between 12 and 18 in. Five months' observations of the stem-inoculated plants and others exposed to soil infection by *V. cinerescens* showed that *Dianthus caryophyllus* was highly resistant, *D. deltoides* immune, and *D. caesius* immune from root infection, while *D. chinensis* and *D. barbatus* were very susceptible. A large percentage of perpetual flowering carnations (?*D. chinensis*) grown in contaminated soil also became infected.

WATERSTON (J. M.). **Report of the Plant Pathologist, 1939.**—*Rep. Dep. Agric. Bermuda, 1939,* 13 pp., 1940.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, pp. 505, 550]. *Septoria lycopersici* was locally severe on unstaked tomato plants. *Sclerotinia sclerotiorum* was found by T. A. Russell attacking parsnip [ibid., x, p. 637] petioles, the same organism also occurring in a particularly destructive form on *Dimorphotheca aurantiaca*. Diseases of other ornamentals included *Iris* rust (*Puccinia iridis*) [ibid., xix, pp. 168, 365] on varieties of the Spanish group at Tucker's Town only; a powdery mildew (*Oidium* sp.) [? *Erysiphe cichoracearum*] on cineraria [ibid., xviii, p. 459], controllable by dusting with sulphur; *E. cichoracearum* on *Zinnia* [ibid., xi, p. 377]; (?) *E. lagerstroemiae* causing flower and leaf blight of *Lagerstroemia indica*; leaf spot of *Hemerocallis* due to *Cercospora hemerocallidis* Tehon; *Peronospora parasitica* on garden stock [*Matthiola incana*]; and lily rosette [yellow flat: ibid., xvii, p. 589], the exceptional intensity of which coincided with a heavy increase in the population of the insect vector, *Aphis gossypii*, with the prevailing dry weather.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 4, pp. 211–215, 5 figs., 1940.

Mulberry blight caused by *Bacterium mori* [*R.A.M.*, xiii, p. 748] is stated to be of common occurrence in New South Wales. The following recommendations are based on experience in other countries: burning of all diseased branches and leaves, and spraying just before bud-burst, and again two or three weeks later, with a mixture composed of 1½ oz. potassium permanganate, 1 lb. starch, and 5 gals. water, or one composed of 0·06 per cent. mercuric chloride and 1·5 per cent. slaked lime.

The leaf blight disease of carrots caused by *Macrosporium carotae* [ibid., xix, p. 324] was first found in New South Wales in 1932 and has since spread to new localities. The leaf spot disease of the same host caused by *Cercospora apii* [? *C. carotae*: ibid., xviii, p. 413; and cf. ibid., xii, p. 356] has been noted only once, in 1939. Both diseases were almost

certainly introduced with imported seed. The following measures against these diseases, based on experience elsewhere, are recommended: crop rotation including carrots only once in every three to four years on the same land; destruction of diseased foliage after harvest; and spraying with Bordeaux mixture 4–6–40 (plus 1 lb. of calcium caseinate as a spreader to 40 gals. spray) at intervals of 7 to 14 days in wet seasons. Spraying is not considered to be worth while in dry seasons.

Hollyhock rust caused by *Puccinia malvacearum* [ibid., xv, p. 776] is stated to have become one of the most common rust diseases in New South Wales. For the control of the disease the burning of all infected foliage and spent stems and dusting with lime-sulphur (1 in 50) several times during the season, particularly during rainy periods, are recommended. A local grower's experience has been that four applications of lime-sulphur at a strength of 1 in 40, begun as soon as the disease appears in the seed-bed, gave good control and caused no injury to the plants.

Plant pathology and physiology.—*Rep. Tex. agric. Exp. Sta., 1938*, pp. 72–81, [?1939].

Apart from work already noticed from other sources this report [cf. *R.A.M.*, xviii, p. 439] contains the following items of interest. W. N. Ezekiel states that rainfall during the growing season was favourable to cotton root rot, *Phymatotrichum omnivorum*, causing a reduction in yield estimated at about 7·6 per cent. of the normal. In laboratory studies by L. M. Blank some 17 carbohydrates were tested as carbon sources for *P. omnivorum* in a nutrient solution. The relationship between the utilization of various carbohydrates and the ability of the fungus enzymes to digest these carbohydrates was very close. The addition of zinc, iron, or manganese in small amounts to the nutrient solution resulted in considerable increases in growth of the fungus, whereas others, particularly copper cobalt and nickel, were toxic even at low concentrations [cf. ibid., xviii, p. 175]. In further studies on the part played by plant alkaloids in the resistance of plants to *P. omnivorum* [ibid., xix, p. 147] G. A. Greathouse and G. M. Watkins found that in roots of *Mahonia* [*Berberis*] *trifoliolata* and *M.* [*B.*] *swaseyi* the alkaloid berberine is impregnated in the walls of tracheids, vessels, and bast fibres, and is present in lumina of cells in the xylem and phloem rays and in the older phloem cells. A more or less continuous sheath of berberine-containing cells surrounds the root just beneath the periderm, forming a defence against the attacks of the root rot fungus.

G. E. Altstatt and A. L. Burkett report that treatment of seeds with ceresan gave positive results against *Bacterium malvacearum*, *Fusarium moniliforme* [*Gibberella fujikuroi*], and *Glomerella gossypii* [ibid., xix, p. 404]; treated seeds gave increased stands, but differences in yield were insignificant.

A. L. Harrison's trials showed that home-made Bordeaux mixture (4–4–50), commercial Bordeaux mixture, cuprocide 54, and copper hydro 40 were effective against bacterial spot of tomatoes (*Bact. vesicatorium*) [ibid., xviii, p. 421], and home-made Bordeaux mixture against early blight, *Alternaria solani* [loc. cit.]. Commercial Bordeaux mixture and cuprocide 54 were less effective, although the latter gave the

highest yields of marketable fruits. The addition of cottonseed oil to home-made Bordeaux mixture did not result in any increase in yield, although there was less leaf injury when the oil was used. In the control of damping-off of tomatoes [loc. cit.] the best results were obtained with cuprocide dust; fair control was obtained by treating the soil with a proprietary dust compound, DuBay 1155 HH, at a rate of 200 lb. per acre.

In G. M. Watkins's test for the control of black spot of roses [*Diplocarpon rosae*: ibid., xix, p. 348 and below, p. 540] several copper compounds were combined in various ways with different forms of sulphur. The best results were obtained with cuprocide, copper hydro 40, and Bordeaux mixture (3–3–50), among sprays, and cuprocide and copper hydro 40 among dusts. The addition of wettable sulphur seemed to reduce the efficiency of these fungicides.

A. A. Dunlap reports the occurrence of lodging of sorghum in certain regions of north western Texas [ibid., xviii, p. 389]. *Sclerotium bataticola* [*Macrophomina phaseoli*] was isolated from the majority of lodged stems, and *Gibberella fujikuroi* frequently from the remainder.

A. L. Burkett reports the results of fungicidal trials for the control of damping-off of beet, bush bean [*Phaseolus vulgaris* var. *nana*], broccoli, cabbage, carrot, cauliflower, lettuce, and parsnip. Seed treatment with ceresan, copper KB, semesan, zinc oxide (AAZ), and particularly cuprocide, applied as dusts, resulted in increased stands. Seedling injury was noted on broccoli and cabbage treated with ceresan. A soil drench (1¾ lb. cuprocide 54 to 50 gals. water), applied to a 4 in. strip along the row directly after planting, and wetting the soil to a depth of 1 to 1½ in., increased the stand of bush beans planted in September to 48 per cent. of the seeds planted as compared with 31 per cent. for the untreated rows.

Botany. *Ex* Work of the Agricultural Experiment Station during the year ending June 30, 1937.—*Bull. Mo. agric. Exp. Sta.* 413, pp. 29–33, 1940.

In this report [cf. *R.A.M.*, xvi, p. 158] it is stated that in seed treatment experiments conducted by C. M. Tucker, J. J. White, and J. E. Livingston with eleven samples of winter barley, formaldehyde, ceresan, corona dust, ansul dust, cuprocide, copper carbonate, basic copper sulphate, dusting sulphur, and zinc oxide caused no significant injury to germination in samples germinated up to six months after treatment. Hot water treatments at various exposures all reduced germination, but notable recovery occurred in most cases, the treated seeds showing a higher percentage of germination two to six months after treatment than immediately after exposure. In field plots planted with high quality samples of Missouri Early Beardless and Kentucky No. 1 barley almost free from smuts (*Ustilago hordei*, *U. nuda*, and *U. nigra*), seed treatments with the same chemicals gave no significant increase in yield, while marked decreases followed the hot water treatments. In germination tests, Kentucky No. 1 showed more injury from every treatment than Missouri Early Beardless, but gave much less reduced yields, so that germination tests do not appear to be reliable criteria of the extent of injury from hot water seed treatments. When surface-sterilized seeds were plated, the internal fungi in [descending] order of frequency were *Alternaria*, *Gibberella*, *Fusarium*, *Chaetomium*, and

Helminthosporium, of which only *G.* and *H.* were pathogenic. Presoaking, prolonged hot water treatment, and ceresan eliminated more than half the internal fungi of Missouri Early Beardless, *F.* and *G.* generally being killed, while *A.* was more resistant.

C. M. Tucker states that when 50 seeds from each of 200 ears of Reid's Yellow Dent maize were germinated, the commonest fungus to develop was *G. fujikuroi*, *Cephalosporium*, *Rhizopus*, *Penicillium*, *Aspergillus*, and *Basisporium* [*Nigrospora*] also occurring [ibid., xix, p. 469]. Seed with under 40 per cent. infection gave seedlings with 23·8 and 7 per cent. root and shoot rot, respectively, the corresponding figures for seed with 60 per cent. infection being 39·2 and 10·1 per cent.

C. M. Tucker and K. W. Simons state that a serious disease of cultivated mushrooms [*Psalliota* spp.] has appeared at two localities in Missouri. The first sign of the condition is the appearance of a few sporophores in a small area in the bed with long, narrow, crooked stipes; the pilei do not reach a normal diameter, and are often tilted. The veil is ruptured early, and the pileus becomes prematurely flattened. The whole sporophore is greyish and dead-looking. Every outbreak occurred during the third break or later. At the next break, the affected area extends 5 to 10 ft. in all directions from the originally infected site, and the disease spreads at the rate of about 1 ft. per day, the infected bed being quite valueless. Inoculations of small beds with pure cultures of fungi and bacteria from diseased material gave negative results, but of three beds inoculated with infected soil one produced diseased mushrooms at the first break. Soil from a diseased bed taken to Columbia, kept for seven weeks, and used for casing beds, gave normal mushrooms at the first break. After two weeks, however, distorted mushrooms appeared. When soil from the diseased bed was kept at 55° C. for two hours, or treated with formaldehyde, calcium cyanide, or carbon bisulphide, and used for casing beds, normal mushrooms appeared throughout the season, all treatments eliminating the toxic condition. In experiments on control spread was effectively checked by soaking the soil and compost with mercuric chloride (1 in 250) in a 6-in.-wide strip 6 ft. in advance of the diseased mushrooms. Trenches 6 in. wide (and also 6 ft. in advance) were even more effective.

Further studies by C. M. Tucker on canker of sweet cherry nursery stock in north-western Missouri confirmed the view that it is due to *Bacterium pruni* [ibid., xv, p. 281]. Inoculation tests also showed that a strain from plum leaves was as virulent as the strain from cherry cankers. When the bacteria were placed in contact with wounded surfaces positive results were obtained, but no infection developed when infected plum leaves were hung among the foliage of sweet cherry trees. Natural infections probably occur in June, when the trees are wounded by the removal of laterals.

Gonçalves da Silva (S.). **Aspecto fitosanitário das principais plantas cultivadas do Estado do Espirito Santo.** [The phytosanitary aspect of the principal cultivated plants of the State of Espirito Santo.]—Reprinted from *Rev. Soc. brasil. Agron.*, xi, 4, 5 pp., 1939 (issued 1940).

A list is given of 114 pathogens of 24 cultivated crops inspected in the

course of a phytosanitary survey of the State of Espirito Santo, Brazil, in 1937–8. Among the problems requiring urgent attention are pod rot of cacao (*Colletotrichum gloeosporioides*) [*R.A.M.*, vi, p. 57; xvi, p. 312; xviii, p. 194], due to which 50 per cent. of fruits of the first flush failed to ripen on two of the properties visited in 1937; white rot of maize (*Diplodia zeae* and *D. macrospora*) [ibid., xvii, p. 238], causing a reduction of up to 20 per cent. in the weight of the seed-grain and gaps in the stand amounting to between 3 and 5 per cent. of the crop [cf. ibid., xix, p. 141]; a species of *Rosellinia* attacking 50 per cent. of the cassava plantings in newly cleared land [ibid., xvii, p. 192], and a complex root rot of obscure origin of the same host (70 to 80 per cent. loss in two localities); and gummosis of citrus (*Phytophthora parasitica*) [ibid., xvi, p. 603], which in 1937 infected 50 per cent. of the young trees in one district and 80 per cent. of the fully grown ones in another.

Posnette (A. F.). **Transmission of 'swollen shoot' disease of Cacao.**— *Trop. Agriculture, Trin.*, xvii, 5, p. 98, 1940.

Material from swollen cacao shoots was budded on to healthy stocks (chupons of three bearing trees in excellent condition) at Tafo in the Gold Coast, and twelve months later the three trees were observed to be severely affected with symptoms resembling those of 'swollen shoot' [*R.A.M.*, xix, p. 261]. In October, 1938, six buddings were made with swollen shoots, using as stocks native farm seedlings planted three to a hole, budding one in each group with a swollen bud and the other two with buds from Asuansi selections as controls. Two of the swollen buds took, one apparently killing the stock in a month. The remaining swollen bud lived on, the stock developing swollen-shoot symptoms three months after budding. No control plant developed the condition. In further budding and grafting three budlings and one graft survived, in all of which transmission from scion to stock took place.

In these experiments the first symptom was leaf chlorosis, which developed about six weeks to two months after budding. The chlorophyll of the old leaves broke down between the veins, while new leaves, as they appeared, were chlorotic, with green veins. Young leaves withered on breaking from the bud, leaving a green, leafless shoot with persistent stipules. Subsequently, axillary buds down the stem produced shoots, frequently in twos or threes, many of which died back before attaining a length of more than 2 in., and were swollen at the base. The final symptom was swelling of the main axis. This appeared five to eight months after budding, and was generally terminal, the apical bud dying. Node constriction sometimes occurred on fans.

These data indicate a virus origin for the condition. In 1939, 70 fresh cases were reported from the 60 acres of cacao at Tafo.

Dillon Weston (W. A. R.) & Brett (C. C.). **Seed disinfection.**— *Nature, Lond.*, cxlv, 3682, p. 824, 1940.

Field and laboratory tests demonstrated that cereal seed-grain dusted with materials containing organo-mercury compounds is unlikely to develop immediate injury if of high initial germination and sound physical condition, and superficially dry when dusted. If the seed is to be stored, no significant loss of germinative capacity is likely

to occur for some months if it is kept in a dry, cool, and well-ventilated place. With well-conditioned seed it is not possible to apply highly excessive doses of these materials, as the dust cannot be retained by superficially dry seed beyond a certain limit. If, however, superficial moisture is present on the seed, that part of the bulk of seed on which the dressing falls (even if applied at no more than the recommended rate) will retain an excessive amount of dust, and subsequent mixing will result in some seeds being heavily over-dusted. These may die, or they may produce abnormal seedlings. There was little evidence that treated seed suffers any serious injury immediately if its moisture content is slightly above normal. Seed with a high moisture content dusted at normal rates and then stored under satisfactory conditions appears to undergo no greater loss of viability than untreated seed of similar moisture content.

MÜLLER (H.). **Selbsttätig arbeitender, vereinigter Kurznass- und Trockenbeizer 'Kombinator' Bauart Dr. Stümpfig der Landmaschinenfabrik G. Drescher, Halle (Saale).** [An automatically working combined short liquid and dry disinfection apparatus, 'Kombinator', constructed to the plan of Dr. Stümpfig of the agricultural machine factory of G. Drescher, Halle (Saale).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), v, 3, pp. 22–24, 2 diags. 1940.

In collaboration with [K.] Ebertz, S. Reeh, and [A.] Winkelmann, the writer tested the combined short liquid and dry seed-grain dusting equipment 'Kombinator' [cf. *R.A.M.*, xix, p. 136] with extremely satisfactory results. The apparatus, treats up to 8 doppelzentner [approximately 16 cwt.] of heavy seed per hour.

KEIL (J.). **Ein neuer Nährboden zu Keimversuchen mit Getreidepilzsporen. (Ustilago avenae, U. tritici, U. hordei, Tilletia tritici und Helminthosporium gramineum.)** [A new nutrient medium for germination tests with cereal fungus spores. (*Ustilago avenae, U. tritici, U. hordei, Tilletia tritici*, and *Helminthosporium gramineum.*)] —*Arch. Mikrobiol.*, xi, 1, pp. 85–88, 1 fig., 1940.

In large-scale germination experiments with cereal fungi (*Ustilago avenae, U. tritici, U. hordei, Tilletia tritici* [*T. caries*], and *Helminthosporium gramineum*) at the Vondran Machine factory, Halle, in 1939, the following procedure gave speedy and reliable results. The medium consists of 1,000 c.c. distilled water, 25 gm. sterilized agar, the filtered extract of 250 gm. oats boiled for one hour in 1,500 c.c. water, 20 gm. dextrose, and 10 gm. charcoal, the whole being boiled for ten minutes prior to the addition of 0·6 gm. potassium hydroxide per 100 c.c. and for a further two minutes before pouring into dishes. After 24 hours on this medium the loose smut and bunt spores were already giving rise to hyphae, while incipient conidial formation by *H. gramineum* was detected on the fourth to fifth day.

LEEPER (G. W.). **Experiments on manganese deficiency disease ("grey speck") of cereals.**—*Proc. roy. Soc. Vict.*, N.S., lii, 1, pp. 138–152, 1940.

In continued plot experiments on the manganese deficiency (grey

speck) disease of cereals [*R.A.M.*, xv, p. 8; xix, p. 430] from 1934 to 1938, acidification of the soil with sulphur to below P_H 6·5 gave the highest yields of both oats and wheat, although during the winter the latter exhibited poorer growth, which improved later on. Application of ammonium sulphate with the seed caused some initial but little final advantage over the control in both oats and wheat. Alkalinization of the soil with caustic soda resulted in a marked improvement in oats up to the end of September, due apparently to the raising of the P_H value of the soil above 8·5. Application of manganese sulphate with the seed caused an increase in tillering (up to 24 per cent. in oats and 30 per cent. in wheat), but the final yields were never greater and sometimes less than on acid plots. The residual effect of manganese compounds applied to the soil in the preceding year was slight in oats; in wheat it was marked, a heavy application of freshly precipitated manganese oxide apparently exerting an effect as good as that of a fresh one.

In pot experiments, addition of a manganese compound, particularly manganese sulphate, caused excellent growth of oats. In pots with deficient sandy soils subjected to four weeks' waterlogging, sick oats plants recovered and showed excellent growth with no addition of manganese at any time. The results of pot experiments in which five different types of soil were heavily limed (with oats as the experimental plant) indicate that a considerable time must elapse before certain soils with a fair original reserve of available manganese are adversely affected by liming to above P_H 7, but where the reserve is low, deficiency appears soon after the application of lime.

Grace (N. H.). **The effect of nutrient salts in organic mercurial seed disinfectants on the germination and early growth of Wheat.**—*Canad. J. Res.*, Sect. C, xviii, 5, pp. 151–157, 1940.

In greenhouse experiments carried out in Canada, wheat seed-grain was treated with disinfectant dusts containing 5 per cent. ethylmercury halides (80 per cent. ethylmercury bromide and 20 per cent. ethylmercury chloride) and three concentrations of each of potassium nitrate, potassium dihydrogen phosphate, ammonium potassium hydrogen phosphate, and monocalcium phosphate. The results showed that this incorporation of nutrient salts into seed disinfectants failed to stimulate germination or early growth of seedlings. In one experiment with Marquis wheat, all salts except potassium dihydrogen phosphate increased root weight three weeks after planting. In the same experiment potassium nitrate accelerated the germination without increasing the final value, but no stimulation was observed in two subsequent experiments with four varieties of wheat.

Beckmann (I.). **El problema del Trigo en el Brasil.** [The Wheat problem in Brazil.]—*Rev. Fac. Agron. Univ., Montevideo, 1940*, 1, pp. 21–36, 1940.

In the course of a discussion on wheat-breeding in the Rio Grande do Sul, the writer refers to the great popularity of the Fronteira and Surpresa varieties, developed from crosses between the local varieties Pollisu and Alfred Chaves 6; both are resistant to yellow rust (*Puccinia glumarum*) and the former in particular is both productive and of

superior quality. It is, however, susceptible to brown rust (*P. triticina*) and of recent years has been attacked by black rust (*P. graminis*), the first severe outbreak of which on this variety occurred in 1933. Some promising crosses have been obtained between Fronteira and Centenario, combining resistance to all three rusts with other desirable qualities.

Rodenhiser (H. A.) & Taylor (J. W.). **Effects of soil type, soil sterilization, and soil reaction on bunt infection at different incubation temperatures.** —*Phytopathology*, xxx, 5, pp. 400–408, 2 graphs, 1940.

In trials at the Arlington Experiment Farm, Virginia, with Hempstead and Mendon silt-loam soils, the former dark and rich (P_H 6·7) and the latter greyish-brown and friable (8·1), there were no appreciable differences in the incidence of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] (L 2 race of the latter) in Marquis and Thatcher wheat seedlings incubated at 10° and 15° C., but at 5° the former variety developed 33 and the latter 42·2 per cent. more infection in the light than in the rich soil. Similar results were obtained in another test with eroded and clay loams (both having a P_H of 4·8, adjusted to obtain a range of up to 8·1 by the addition of calcium carbonate), consistently higher percentages of bunt occurring in the former than in the latter at 5° and 10°, whereas at 15° the differences were insignificant except at the most acid reaction, which induced 34·7 per cent. more infection in the clay than in the eroded loam. Soil type and temperature during the incubation period are thus closely interrelated in the determination of the degree of infection contracted by a given variety. Generally speaking, there was an increase in the amount of infection in both the eroded and clay loams from the highly acid samples to those approaching neutrality, especially from P_H 4·8 to 5·5.

No general conclusion could be drawn from the effects of steam sterilization on bunt infection. In the case of the Mendon silt loam the treatment reduced the incidence of the disease in both varieties at all three incubation temperatures, but on the Hempstead loam the results of the tests were inconsistent; a very heavy increase (from 30·9 to 94·6 per cent.) followed incubation at 5°, whereas at 15° there was a drop in the bunt count from 71·7 to 13·7 per cent.

Stevens (N. E.). **Losses from bunt of Wheat in the United States.**— *Phytopathology*, xxx, 5, pp. 449–451, 1 graph, 1940.

A comparative analysis of the figures of the estimated wheat and rye crop losses in the United States from 1917 to 1937 due to (*a*) smuts in general and (*b*) bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, x, 716; xiv, p. 626] revealed a more or less steady decline in the incidence of both groups since the peak year of 1926, when the losses from the two sources were computed at about 4·7 and 3·9 per cent., respectively. It is apparent from a perusal of the two curves that bunt was responsible for a large proportion of the total estimated losses from wheat smuts: the incidence of infection in rye (subject to the same grading for 'smuttiness' as wheat) was too low during the period for which statistics are available for inclusion on the graph, but infected carloads were occasionally reported.

Sallans (B. J.). **The use of water by Wheat plants when inoculated with Helminthosporium sativum.**—*Canad. J. Res.*, Sect. C, xviii, 5, pp. 178–198, 4 graphs, 1940.

In greenhouse experiments in Canada, wheat plants inoculated with *Helminthosporium sativum* showed a marked reduction in water loss during the early stages of growth as compared with uninoculated plants. The transpiring leaf area of the plant was markedly reduced up to the fourth leaf to appear. The later leaves, however, were larger, and as the early ones died the total transpiring area became equal to, and eventually greater than, that of uninoculated plants. This recovery, followed by an increase in yield of dry matter, took place only under favourable conditions, such as good light and high soil moisture. The variety Reward was more severely injured in the early stages and recovered more rapidly than Marquis. No significant increase was observed in water requirements of inoculated over uninoculated plants. It is believed that under field conditions, where competition for soil moisture and nutrients takes place, complete recovery of infected plants can hardly be expected. Several tentative explanations are offered for the recovery of the inoculated seedlings in the greenhouse. It may be that the toxin development by the fungus, which is probably responsible for the initial injury, is in later stages either reduced below harmful concentrations or arrested altogether, so that normal growth can be resumed; or the rate of intake of mineral ions into the plant may be increased under the toxic influence of the fungus, and as the effects of the toxic substances decrease, the presence of large amounts of minerals may result in the formation of larger leaves.

Ajroldi (P.). **Nuovo contributo allo studio biologico delle 'Tilletia'.** [A new contribution to the biological study of *Tilletia*.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 149–157, 1940.

As a result of further experimental inoculations of rye, wheat, and the rye × wheat hybrid Terminillo with *Tilletia* [*T. caries* and *T. foetens*: *R.A.M.*, xvii, p. 165] the author concludes that under Italian conditions bunt is not transmissible to rye, and that the infection of wheat through lancet cuts by means of chlamydospores is possible only in the early stages of growth, the fungus requiring for its complete development a long period of growth within the host. From the results obtained it would also seem that the germinability of the chlamydospores reaches an optimum during their second year, virulence remaining high for at least the first five years. Further evidence was obtained that prolonged and difficult germination of wheat seed facilitates bunt attack. One Terminillo ear showed the presence of both bunt and a perfectly developed sclerotium of *Claviceps* [? *purpurea*].

Garrett (S. D.). **Soil conditions and the take-all disease of Wheat. V. Further experiments on the survival of Ophiobolus graminis in infected Wheat stubble buried in the soil.**—*Ann. appl. Biol.*, xxvii, 2, pp. 199–204, 1940.

The results of continued studies on the take-all disease of wheat (*Ophiobolus graminis*) [*R.A.M.*, xviii, p. 386; cf. also ibid., xix, p. 465] are presented. Microscopic examination showed that the characteristic

dark mycelium of *O. graminis* continues to develop in the cells of artificially infected wheat straw after this has been buried in the soil. This development is markedly greater and more prolonged when excess of available nitrogen is present. These observations seem to indicate that the survival of the mycelium depends mainly upon the supply of available food material in the straw, which is limited by the supply of soluble nitrogen. Additional nitrogen directly benefits *O. graminis*, enabling the mycelium to assimilate more of the undecomposed carbohydrate reserves of the straw. Under soil conditions, such as high aeration, favouring general microbiological activity, the rate at which the available food reserves in the straw are used up is increased, and consequently the disappearance of the mycelium is hastened. On this new hypothesis, other soil micro-organisms are assigned a competitive rather than directly antagonistic relation towards *O. graminis*.

Johnson (T.) & Brown (A. M.). **Studies on Oat blast.**—*Sci. Agric.*, xx. 9, pp. 532–550, 3 figs., 1 graph, 1940.

Greenhouse and field experiments [which are fully described] carried out in Canada showed that the amount of 'blast' disease developing on oats [*R.A.M.*, xix, p. 272] is readily affected by the nutritional condition of the plant from the initiation of the spikelets until just before panicle emergence. At this stage, blast was increased by (1) reducing the water supply, (2) withholding mineral nutrients, (3) artificially injuring the leaves, (4) leaf injury caused by a combined epidemic of stem and crown rusts [*Puccinia graminis avenae* and *P. coronata avenae*, respectively], and (5) growing the plants under progressively diminishing periods of daylight. In some varieties there was a tendency for oats sown early in May to show less blast than plants sown later. Decrease in yield was accompanied by a reduction in panicle size, and often by increase in the percentage of blasted spikelets.

Reed (G. M.). **Reports on research for 1939. Plant pathology.**—*Rep. Brooklyn bot. Gdn, 1939* (*Brooklyn bot. Gdn. Rec.*, xxix, 2), pp. 51–56, 1 fig., 1940.

Many F_3 progenies of different oat crosses were grown in continuation of studies on the mode of inheritance of resistance to loose and covered smuts [*Ustilago avenae* and *U. kolleri*: *R.A.M.*, xviii, p. 587; xix, p. 466]. Duplicate sets of seed for growing 145 F_3 progenies of Green Mountain × Monarch were inoculated, one with physiologic race 1 of *U. avenae* and the others with race 3 of *U. kolleri*, the latter originating in France. The experimental data indicate that inheritance of resistance to both these smuts is controlled by a single factor difference, and further, that resistance to each smut is inherited independently. In the cross under observation, Green Mountain is susceptible to the race of *U. avenae* used in the tests, while Monarch is resistant; conversely, Green Mountain is resistant to race 3 of *U. kolleri* and Monarch susceptible. In similar tests with 265 F_3 progenies of Navarro × Hull-less, using races 1 of both smuts, to which the former variety is resistant and the latter susceptible, the inheritance of resistance to *U. avenae* and *U. kolleri* was found to be governed by two and three independent factors, respectively. Race 1 of *U. avenae* was inoculated into 165 F_3 progenies of the susceptible Goth-

land and resistant Navarro varieties, in which cross the inheritance of resistance was shown to be controlled by two independent factors [ibid., xix, p. 399]. Several factors were found to be involved in the inheritance of resistance to a highly specialized race of *U. kolleri* in 151 F_3 progenies of Navarro × Black Mesdag.

The following method of inoculation has been uniformly successful in the production of high percentages of infection; the hulls of the grain are removed, the kernels inoculated with dry smut spores, and the seed germinated in sand with a low moisture content at about 20° C.

Further inoculation experiments by L. G. Utter with 34 collections of smut resulting from hybridization between *U. avenae* and *U. kolleri* [ibid., xviii, p. 15] led to the differentiation of at least eight physiologic races of covered and seven of loose smut. Gothland continued to show susceptibility to *U. kolleri*, whereas the reactions of Monarch ranged from susceptibility to full resistance. The loose smut collections gave uniformly high infections on Monarch, while Gothland was resistant to some and susceptible to others.

Pursuing her studies on the varietal reactions of sorghum to loose and covered smuts (*Sphacelotheca cruenta* and *S. sorghi*) [ibid., xvi, p. 666], D. Elizabeth Marcy found Dakota, Amber, Sorgo, Dawn Kafir, and Shallu susceptible, and Feterita, Dwarf Yellow Milo, and Darso resistant. A combination of the following conditions retarding seedling growth contributed to the development of heavy infection on susceptible varieties: maintenance of a low soil moisture content (10 per cent. of the water-holding capacity); moisture supplied as a 2 per cent. sucrose solution; low temperature; very fine sand; and heavy tamping of the sand in which the seeds were germinated.

Schmitt (C. G.). **Cultural and genetic studies on Ustilago zeae.**—*Phytopathology*, xxx, 5, pp. 381–390, 1940.

In laboratory studies at the University of Missouri chlamydospores of *Ustilago zeae*, the agent of maize smut [*R.A.M.*, xviii, p. 670], germinated in 12 to 24 hours at 25° to 30° C. on modified Czapek's agar. At lower temperatures germination was atypical and retarded, delay likewise following exposure to monochromatic ultra-violet irradiation at 2,650A°, 21,000 to 56,000 ergs per sq. mm. [ibid., xix, p. 84], the lag period increasing with rising doses. Chlamydospores germinated in profusion immediately after collection, apparently without requiring any previous resting period. Plants of all ages were found to be highly susceptible in greenhouse inoculation experiments with compatible lines of the smut, as long as meristematic tissue was present, at a temperature range of 27° to 32° C.: below 21° no infection occurred but anthocyanin was formed at the site of insertion of the inoculum.

As already shown by Stakman and associates [ibid., ix, p. 713], the appearance of the colonies and mutation rate were strongly influenced by the composition of the medium, cultures on Difco maize meal agar giving rise to fewer sectors than those on more nutritive substrata, such as potato dextrose agar. On the basis of a comparative study of six different media from this standpoint, modified Czapek's agar, combining a fairly low rate of sectoring with good growth, was used for the

maintenance of stock cultures at temperatures below 18° and maize meal for the detection of mutation following irradiation. Between 20°, at which few or no sectors arose, and 37·5°, above the maximum for the lines under observation, rises in the incubation temperature were accompanied by an increased frequency of sectoring. The incidence of mutation was not affected by inbreeding for ten generations, by ultra-violet or X-ray irradiation, or by brief exposure of the sporidia to temperature near the thermal death point.

Attempts to induce chlamydospore formation in *U. zeae* in pure culture were uniformly unsuccessful.

Stocks exhibiting the characteristic mycelial and sporidial growth types were established in the parental generation and inbred as far as the tenth and seventh generations, respectively. Cream- and beige-coloured lines were laid down in the eighth generation and the latter inbred to the tenth. The mutation rate of sporidial lines was approximately three times that of mycelial. Segregation of factors for colour, sex, and growth type took place in both I and II of the reduction divisions, as determined by seriation of the promycelial cells, in ratios of 3 : 1, 1 : 1 (4 : 0 in one instance), and 1 : 3, respectively. Out of some 4,000 monosporidial lines, three were monopathogenic, but spores from galls produced by inoculation with one of these lines did not give rise to strains of a similar habit.

Barton-Wright (E. C.) & Tomkins (R. G.). **The moisture content and growth of mould in flour, bran, and middlings.**—*Cereal Chem.*, xvii, 3, pp. 332–342, 3 graphs, 1940.

A tabulated account is given of the writers' studies at the Research Association of British Flour-Millers, St. Albans, and the Low Temperature Research Station, Cambridge, on the effects of temperature, relative atmospheric humidity, and water content of the flour on mould growth in flour, bran, and middlings [cf. *R.A.M.*, xv, p. 574].

Small (4 gm.) samples of flour with an initial water content of 14 per cent. were spread on Petri dishes supported on glass tripods above museum jars containing solutions of sodium chloride (4 to 32 gm. per 100 c.c. water, corresponding to relative humidities of 97·5 to 79 per cent.), and stored at 20°, 15°, 10°, and 5° C. The development of moulds in the control samples (over jars containing no sodium chloride, 100 per cent. relative humidity) took place in 8, 11, 18, and 20 days, respectively, at 20°, 15°, 10°, and 5°, the corresponding periods at 97·5 per cent. humidity being 9, 11·5, 18·5, and 25 days; at 95·1 per cent. 12, 15, 20, and 27 days; at 92·6 per cent., 13, 18, 25, and 43 days; at 90·2 per cent., 14, 23, 36, and 53 days; and at 87·7 per cent., 18, 40, 64, and 123 days. At 85·1 per cent. relative humidity moulds appeared 29, 57, and 123 days at 20°, 15°, and 10°, respectively, no growth developing at 5°; at 82·5 per cent. they were observed after 79 at 20° only; and at 79 per cent. no infection occurred. In similar tests with bran, the moulds developed at lower humidities, appearing after 35 days at 20° at a relative humidity of 79 per cent. Flour exposed to humidities between 90 and 80 per cent. is attacked mainly by *Penicillium* spp., while bran under the same conditions is infected by both *P.* and *Aspergillus* spp. Mould growth has not been detected on wholemeal exposed at

a relative humidity of 75 per cent. at 20°, whereas bran under similar conditions showed fungal contamination after three to six months.

Most samples of flour containing over 16 per cent. of water were found to be just sufficiently moist to permit of mould growth, which does not ordinarily occur on those with a lower water content. Wholemeal containing 17 per cent. water is liable to mouldiness, which does not affect samples with 15·3 per cent. Bran with a water content of 17 per cent. became mouldy after 40 days and one sample with 15·3 per cent. after 90 to 120.

After 40 days at 20° the average numbers of fungal spores per gm. of flour with water contents of 19·6, 17, 16·5, 15, and 14 per cent. were 30,000,000, 5,000,000, 3,300, 5,300, and 5,100, respectively, while after 250 days the samples with water contents of 16·5, 15, and 14 contained 54,000, 3,000, and 2,900, respectively. After 40 days at 15° the samples with water contents of 19·6, 16·5, and 15 per cent. contained 32,000,000, 3,200, and 5,400 spores, respectively, the corresponding figures after 250 days for the two lower water contents being 38,000 and 3,300, respectively.

On the whole, these figures are in satisfactory agreement with those obtained by the method of exposing flour to atmospheres of different relative humidities, and support the conclusion that the critical water content for fungal growth is approximately 16 per cent. In commercial practice, however, this figure would be near the danger point, and to be on the safe side, a water content not exceeding 15 per cent. and storage at a relative humidity of 80 per cent. or less are advocated.

Cotterell (G. S.). **Citrus fruit-piercing moths—summary of information and progress.**—*Pap. Third W. Afr. agric. Conf., 1938* (Gold Coast Sect.), pp. 11–23, 5 col. graphs, [? 1940].

In connexion with the author's investigations on the losses to the Gold Coast citrus crop caused by the depredations of moths (chiefly *Othreis fullonica* and *Achaea lenardi*), an inquiry was undertaken by H. A. Dade into the part played by fungi in the fall of grapefruit shortly after puncture by the insects. *Oospora citri-aurantii* and *Penicillium digitatum* were found to be the chief organisms involved, the mean intervals between moth puncture and fall of the fruit being 15 and 4·5 days, respectively. Sterile control punctures made with needles produced no effect, indicating that the fungi are responsible for fruit fall.

Dastur (J. F.). **A new Corticium on Orange stem.**—*Indian J. agric. Sci.*, x, 1, pp. 89–92, 1 pl., 1940.

A diagnosis [in English only] is given of *Corticium album* n.sp., observed in 1938 in the Nimar district, Central Provinces, forming a white film, about 10 cm. in breadth, on the bark of orange trees from soil-level up to a height of about 30 cm. The growth is superficial and does not appear to injure the host. The fungus is critically compared with other species of *C.* for possible affinities, and evidence of its non-relationship presented.

Biale (J. B.). **Effect of vapors from moldy fruits on coloring and respiration of Lemons.**—*Calif. Citrogr.*, xxv, 6. pp. 186, 212, 1 fig., 2 graphs, 1940.

The vapours given off by single mouldy lemons inoculated from pure

cultures of *Penicillium digitatum*, *P. italicum*, *Sclerotinia sclerotiorum*, and *Aspergillus niger* at the University of California were passed at a constant rate through cotton-wool filters into jars filled with 50 to 60 sound fruits. The effect on respiration was ascertained by determining the carbon dioxide evolved in three one-hour tests, during which the container with the infected fruits was disconnected from the jar.

The most striking effects in 13 tests on lemons and one on oranges were produced by the emanations from fruits infected by *P. digitatum*, which increased the evolution of carbon dioxide by 50 to 100 per cent. Cultures on potato dextrose agar produced similar results. The activity of this organism was definitely inhibited by low temperatures (20° C.), while high ones (25°) did not appear to cause any acceleration as compared with the normal experimental temperature of 14·5°. The effects of *P. italicum* on the respiratory functions were much slighter than those of *P. digitatum*, while those of *S. sclerotiorum*, *A. niger*, *Oospora*, and *Alternaria* (the two latter used in other tests) were negligible.

The emanations of *P. digitatum* induced a rapid yellowing of green lemons, a similar but slighter effect being exerted by *P. italicum*, and none by the other fungi tested. Shedding of the stem ends was induced by *P. digitatum* only. The gaseous products of this pathogen appear to have an effect on the fruit similar to that of ethylene [*R.A.M.*, xvi, p. 744; xix, p. 470].

[This work is also described in *Science*, N.S., xci, 2367, pp. 458–459, 1 graph, 1940.]

Dwyer (R. E. P.). **Some investigations on Coco-nut diseases, associated with soil conditions in New Guinea.**—*New Guinea agric. Gaz.*, v, 3, pp. 31–53, 2 figs., 1 graph, 1939; vi, 1, pp. 2–37, 4 figs., 2 graphs, 1940.

A three years' investigation of a wilt disease of young coco-nut palms at Kokopo, New Britain, and Namatanai, New Ireland, in New Guinea, referred to in an earlier paper as an 'obscure physiological trouble' [*R.A.M.*, xvi, p. 670], showed that the palms affected were of the tall, very erect, and close-growing type, often presenting a frond-choked appearance. The roots of affected palms penetrated only the upper layers of soil, much less deeply than the roots of healthy palms. The appearance of the disease was associated with a pronounced spell of dry weather following on relatively heavy rains. A lowered vitality, due possibly to dry weather, insect attack, or fungal invasion, was a factor predisposing palms to disease. It is significant in this connexion that recovery was coincident with the proper cleaning-up of the plantation and more particularly with the incidence of abundant rainfall. When the palms were cut back judiciously later on and not too many fronds removed they made a good recovery. The disease had appeared in the affected areas in dry periods during three successive years (till 1937), but did not recur in the following two. The disease is compared with similar ones elsewhere and the close resemblance to 'bronze wilt' described from Trinidad [ibid., xvii, p. 390] is stressed. The evidence presented shows the disease to be most probably physiological, although the possibility of virus origin is not excluded. Soil analyses seem to indicate a certain amount of potash deficiency. It is proposed to desig-

nate this disease of young palms 'maturation wilt' as distinct from the more serious and permanent 'mature palm wilts'. The condition of frond-choke is characterized by erect and poorly-developed fronds, the outside leaves closely crowded round the growing point, and their bases bound together instead of growing free. As fresh fronds appear, they become progressively smaller, the palm presenting a sickly, yellow appearance. As far as is known this condition is not due to parasitic fungi; it is possibly of virus origin, but more probably due to physiologic causes. A necrotic deficiency spotting was noted on palm leaves in conjunction with the foregoing conditions; no organisms were found associated with the numerous small brownish spots present.

Mature coco-nut palms from the plantations situated on the deltaic and estuarine deposits of the Huon Gulf and Astrolabe Bay areas of the New Guinea mainland suffer from various types of wilt. Palms most likely to be affected are those growing on soils with unsuitable profiles, subject to waterlogging in the wet season and to drying-out and compaction in the dry season. Wilts of the 'bronze leaf' type are not nearly so severe or prevalent as in the West Indies. A general wilting is often observed after a long spell of dry weather in palms growing on light, porous soils of poor water-holding capacity; these palms recover immediately when rains set in. An extreme case of 'mature palm wilt' was observed in the Huon Gulf area on 21- to 27-year-old palms. 'Leaf droop' and 'leaf break' were most prevalent and the palms were stunted and bore poorly; in many areas tapering stem, yellowing, and bronzing of the fronds, and reduction in their size and number, were very noticeable. The condition clearly suggested unsuitable soil and cultural factors. The occurrence of nut fall on soil horizons with a shallow top layer and an excessive lime status is attributed to unsuitable soil and water relationships. Coco-nut palms grown after soil-exhausting native crops, sisal hemp [*Agave sisalana*], or tobacco usually appear stunted and weak, although they rarely assume an acutely wilted appearance.

What is stated to be the first undeniable diagnosis of true bud rot (*Phytophthora palmivora*) [ibid., xvi, p. 670] in New Guinea is reported from several plantations. The only losses of palms from bud rot occurred on heavy soils in regions with abundant rainfall. The following series of diseases were noted on areas affected by true bud rot, obviously influenced by related environmental conditions: leaf droop, leaf break, nut fall, frond fall, leaf scorch, deficiency spotting, taper stem, chlorosis, stem bleeding (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., xv, p. 15), *Pestalozzia* [*palmarum*], leaf-spotting, thread blight (*Corticium penicillatum*), *Botryodiplodia theobromae*, and a condition tentatively named 'gummy leaf'. It is suggested that many of these conditions, particularly the first nine listed, are symptomatic of the particular soil conditions prevailing, rather than distinctive diseases.

Recommendations for correct agricultural practices in relation to all coco-nut diseases, and particularly those of physiological origin, are summed up as follows: selection of suitable soils [cf. ibid., xviii, p. 104] for sites of new plantations; adoption of proper cleaning and planting methods and seed and nursery selection; eradication of soil-exhausting grasses; avoiding the cultivation of palms on land where soil-exhausting

native crops have previously been grown; use of drier ash and composted manure; application of complete fertilizers and potash manures to increase the vigour of the palms; and growing of cover crops on heavy soils.

Sabet (Y.). **Mycorrhizal habit in the Date Palm (Phoenix dactylifera Linn.).**—*Nature, Lond.*, clxv, 3681, pp. 782–783, 2 figs., 1940.

Fifteen-month-old date palms grown at Cairo in pots containing Nile silt showed the presence of vesicular-arbuscular mycorrhiza [*Rhizophagus*: *R.A.M.*, xviii, p. 470]. The affected roots became hypertrophied and thicker and more opaque than uninfected roots, and sometimes simulated coralloid roots. The extramatrical mycelium was readily visible. The invading hypha formed a kind of appressorium before effecting penetration. After invading the thick, outer cellulose wall the fungus passed through the cell cavity, developed in a characteristic spiral manner through a radial row of cortical cells 3 to 4 layers deep, spread laterally and inwardly for 3 to 4 layers, producing spirals of hyphae within the cells, and finally ramified in the cortex, with the production of vesicles and arbuscles. In some instances the whole of the cortical cells and the intercellular spaces, except for the outermost 4–6 layers and the two layers next to the endodermis, were packed with the fungus. Further investigations are in progress.

Progress Reports from Experiment Stations, season 1938–39.—198 pp., 5 graphs, London, Empire Cotton Growing Corporation, 1940.

These reports [cf. *R.A.M.*, xviii, p. 573] contain, *inter alia*, the following items of interest. At Barberton, South Africa, soil dressings of superphosphate and sulphate of potash failed to give any significant reduction in *Alternaria* disease of cotton [loc. cit.], though the treated plots gave better yields than the control. Experimental evidence indicates that the condition is a debility disease.

A survey of cotton boll diseases at Barberton showed that internal boll disease (*Nematospora gossypii* and *N. coryli*) [ibid., xviii, p. 308] caused very little damage to the early-planted crop, in spite of early and, presumably, heavy insect immigration and a rise in vector population before all the bolls had matured to over 45,000 per acre. This escape is attributed to two facts, (1) insects carrying the fungi were only a small proportion of the immigrant potential vectors, and (2) most of the crop came from bolls formed relatively early. From pieces of lint taken from underneath insect punctures *N. gossypii* was isolated 87 times, *N. coryli* 16 times, *Eremothecium ashbyi* once, and an unidentified yeast-like organism 9 times, the lint being sterile in 128 instances. Almost all the infections were very slight.

Bacterial boll diseases were of three types in respect of means of entry (excluding those in which the boll walls were destroyed by larvae), viz. (1) direct attack on the uninjured boll wall tissues, the lesions advancing through the wall and bacteria eventually attacking the lint, (2) entrance through a channel left at the tip of the boll by incompletely joined carpels, and (3) entrance through insect punctures, with boll wall lesions, if present, spreading from within outwards. Three species of bacteria appeared to be concerned, *Bacterium malvacearum* and two

unidentified organisms, Y and G. Of these, *Bact. malvacearum* and Y appeared to be capable of considerable destructive activity under rather dry conditions, while G was associated almost entirely with bacterial rotting in very wet weather.

Wilt disease (*Verticillium dahliae*) was found in two plants at Barberton (no further spread being observed), and in a number of plants from Magut.

The seed disinfection test against *Bact. malvacearum* begun the year before in Swaziland [ibid., xviii, p. 573] was continued with ginnery seed mechanically delinted. The results showed a marked increase in germination rate on the plots with sulphuric acid-treated seed. As before, mercury treatments (two dusts and two wet preparations) and sulphuric acid markedly reduced primary infection. Because of the spread of infection from plot to plot, a further test was made, in which each plot was separated from the next by five rows of kaffir corn [sorghum]. Spread of infection was conspicuously reduced in the treated plots, infection in the sulphuric acid plots being 1·5 and 35 per cent. at 6 and 7 weeks, respectively, as compared with 8·6 and 90 per cent. at similar dates in the unprotected experiment.

In the Gezira (Anglo-Egyptian Sudan), cotton was generally infected by blackarm [*Bact. malvacearum*], but, except in localized areas, the attack was not severe. Leaf curl [ibid., xviii, p. 391] was negligible until late in the season. In the Gash Delta there was a severe attack on Domains Sakel cotton, but N.T. 2/36 was resistant. At Kadugli the new substrain N.T. 58, a promising, large-bolled, fruitful strain, showed marked resistance to blackarm and jassid infestation.

In the Bukalasa area of Uganda blackarm was not serious. The cotton wilt diseases due to *Fusarium* [spp.] and *V.* [*dahliae*: ibid., xviii, pp. 574, 575] are becoming increasingly important. It is impossible to distinguish between the two wilts in the field, and resistance is taken as being resistance to wilt. In the breeding plot, B. 181 derivatives were comparatively resistant, and in the main variety trial B. 181 showed more resistance than S.P. 84 and B.P. 116; as many plants free from external symptoms of wilt show discoloration in the xylem of the main stem, differentiation was made between external and internal symptoms. The evidence indicated that wilt incidence may be reduced by shading and lessening of exposure.

In the Serere area of Uganda blackarm was more prevalent than in the previous season, though the rainfall in 1938 was 12 in. less than in 1937. S.P. 20 and S.P. 84 were again more resistant than S.G. 29 [ibid., xviii, p. 574], but S.P. 102 was unsatisfactory. S.P. 84 has maintained its yield, its ginning percentage, its blackarm resistance, and its spinning quality over a wide range of variety trials.

In Trinidad the cotton disease known locally as 'crumple' was identified as anthracnose (*Gloeosporium* [*Glomerella*] *gossypii*) [ibid., xix, p. 404]. It was less prevalent than formerly. The *G*[*ossypium*] *barbadense* types from the dry countries of western South America are the most susceptible, and if grown outside in the rains serve as a reservoir of spores, from which an epidemic may develop in certain Upland strains and much of the local hybrid material. Marked differences in susceptibility are found in closely related material.

Clegg (Gladys C.). **The examination of damaged Cotton by the Congo red test: further developments and applications.**—*J. Text. Inst., Manchr*, xxxi, 5, pp. T49–T68, 10 pl., 1 fig., 3 graphs, 1940.

When samples of Sakel cottons were inoculated with different fungi and tested for tendering, a correlation was found to exist (with a few exceptions) between the results of the Congo red examination [*R.A.M.*, vi, p. 29] and fungal ability to decompose cellulose. With *Rhizopus* 85 (as numbered in the Shirley Institute culture collection, 1935–6) and *Aspergillus tamarii*, which showed no power to decompose cellulose, Congo red examination revealed no effect. With the following fungi, which showed moderate power to decompose cellulose, viz. *Penicillium* 2, *A.* 46, *A.* 45, *A. niger* 8, *A. niger*, *A.* 61, and Record 83 the Congo red test disclosed, respectively, (1) irregularly damaged cuticle after preliminary swelling in 18 per cent. caustic soda, (2) no effect, (3) no effect, (4) fine multiple spirals with some fibres bright red, (5) fine multiple spirals, bright red, (6) coarse spirals, and (7) bright red with incomplete deconvolutions. With fungi showing strong cellulose-decomposing ability, viz. *A.* 48, *P.* 42, *Fusarium*, and [*A.*] *fumigatus* the effects were, respectively, (1) bright red with incomplete deconvolutions, (2) the same, (3) bright red, splitting along quick spirals, and (4) bright red with incomplete deconvolutions.

Some forms of bacterial tendering were found to produce a highly characteristic appearance, while in others tendering was indistinguishable in the Congo red test from that due to fungal attack, and the distinction had to be made by standard staining tests.

Mechanical tendering is sometimes closely simulated, but for the presence of hyphae, by fungal tendering. Chemical tendering results in gradual breakdown of the cuticle. Biological tendering caused by fungi or bacteria may resemble mechanical or chemical tendering, but the disintegrated appearance of the fibres and their tendency to break up along the quick spirals, as well as the presence of the associated organisms, are distinguishing features.

Tomitu (K.), Sugiyama (K.), & Shiota (K.). **A case of induration of liver due to thrush-Oidium.**—*Orient. J. Dis. Infants*, xxv, 3, 13 pp., 1 pl., 1939. [Japanese, with English summary on p. 41.]

This is an account of a very rare, fatal case of induration of the liver in a five-year-old girl at the Children's Clinic of the Kyoto Imperial University, Japan, associated with the thrush *Oidium* [*Candida albicans*: *R.A.M.*, xix, p. 408]. Oidial elements were detected in profusion in the lymphatic apparatus and a few were also present in the spleen.

Jones (C. P.) & Peck (R. L.). **A green pigment from Candida stellatoidea and Candida albicans.**—*J. Bact.*, xxxix, 5, pp. 605–608, 1940.

A green pigment, serving as an indicator and giving blue-green and yellow reactions in acid and alkaline solutions, respectively, was found to occur in blood agar cultures of *Candida stellatoidea* and *C. albicans* [*R.A.M.*, xviii, p. 592 and next abstract] in experiments at the Duke University (North Carolina) School of Medicine. The pigment, which appeared to be a weak acid and somewhat unstable, was produced in

much larger quantities (more than tenfold) by *C. stellatoidea* than *C. albicans*, thus affording an additional means of differentiation between the two fungi.

MARTIN (D. S.) & JONES (C. P.). **Further studies on the practical classification of the Monilias.**—*J. Bact.*, xxxix, 5, pp. 609–630, 1940.

At the Duke University (North Carolina) School of Medicine the authors have studied 535 non-ascus-forming, mycelium-producing, yeast-like fungi [*R.A.M.*, xvi, p. 811]. The great majority of these were found to agree in all respects with the criteria established for the six species previously described, namely, *Candida albicans*, *C. stellatoidea* [see preceding abstract], *C. parakrusei*, *C. krusei*, *C. tropicalis*, and *C. pseudotropicalis*.

The reduction of the number of *C.* spp. by Langeron and Guerra [ibid., xviii, p. 253] is commended, but a further limitation is proposed through the relegation of *C. triadis* and *C. intermedia* to synonymy with *C. albicans* and *C. tropicalis*, respectively. *C. brumpti* and *C. flareri*, moreover, are nearly related to *C. parakrusei*.

The writers' separation of *C. stellatoidea* from *C. albicans* has been criticized, but in addition to cultural and enzymatic differences between the two organisms, the former is consistently non-toxic and the latter pathogenic to rabbits.

In conclusion it is pointed out that cultures kept on artificial media for many years are liable to undergo far-reaching dissociation [ibid., xix, p. 344] or other changes rendering them unsuitable for comparison in the identification of newly isolated strains. Furthermore, slight variations in experimental technique produce such extensive modifications in growth and biological characters that many of the older descriptions require careful interpretation before being assigned to their places in more modern systems of classification.

RE (S.). **Note on the permanency of the fermentative characters of certain species of Monilia.**—*J. trop. Med.* (*Hyg.*), xliii, 10, pp. 137–138, 1940.

A table is given showing the results of a recent study of the fermentative characters of *Monilia* [*Candida*] *krusei*, *M.*[*C.*] *pinoyi*, *M.*[*C.*] *tropicalis*, *M. guilliermondi* [*R.A.M.*, xix, p. 18], *M.* [*or C.*] *pseudotropicalis* [ibid., xix, p. 16], and *M.*[*C.*] *macedoniensis*, all of which remain exactly as when originally isolated by Castellani in 1909–10 [ibid., xvi, p. 99 *et passim*].

SAGGESE (N.). **Contributo allo studio delle micosi umane : le mycotorulosi intestinali infantili.** [A contribution to the study of the human mycoses: the infantile intestinal mycoses.]—*Riv. Clin. pediat.*, xxxviii, 1, pp. 1–35, 1940.

This is a critical discussion of the clinical and mycological aspects of seven cases of infantile intestinal disorders examined at the Children's Hospital, Pisa, and attributed in six to primary infection by *Mycotorula* [*Candida*] *albicans*, associated in one patient with *Mycocandida* [*C.*] *pseudotropicalis* and *Pichia chodati*; in another case *Rhodotorula mucilaginosa* and *C. pseudotropicalis* were isolated (identifications of Prof. O.

Verona). *C. albicans* and *C. pseudotropicalis* were pathogenic to rabbits (the former more strongly than the latter), the other two organisms innocuous. There is considered to be no doubt that *C. albicans*, at any rate, is an important etiologic agent in the intestinal disturbances of children.

De Almeida (F.) & Lacaz (C. Da S.). **Considerações sobre um caso de blastomicose cutaneo-mucosa.** [Considerations on a case of cutaneous-mucous blastomycosis.]—*Ann. paulist. Med. Cirurg.*, xxxviii, 4, pp. 285–292, 6 figs., 1939. [English summary.]

Following a concise survey of F. L. Niño's recent classification of the blastomycoses into three groups (*Prensa méd. argent.*, xxv, 47, 1938), viz.. blastomycoses *sensu stricto*, produced by true yeasts; parablastomycoses, due to fungi not properly to be classed as yeasts botanically speaking, but simulating them in the development of budding cells; and pseudo-blastomycoses, caused by organisms in which the budding phase of reproduction is lacking, the authors describe a case of the first group characterized by infection of the lower lip and oral mucus and also of the right hand in a male patient at the Faculty of Medicine, University of São Paulo, Brazil. A species of *Candida*, with budding cells 3 to 5 μ in diameter, was isolated from the diseased tissues.

Gray (F. C.). **Two cases of Torula meningitis with special reference to the laboratory findings.**—*S. Afr. med. J.*, xiv, 4, pp. 65–70, 5 figs., 1940.

A detailed account is given of two fatal cases of *Torula* infection of the central nervous system (*T. histolytica* or *Debaryomyces hominis* [*D. neoformans*: *R.A.M.*, xviii, p. 800]), one in a European woman and the other in a male Eurafrican, both at Port Elizabeth, this being only the third record of the disease in South Africa. In the first case tuberculous meningitis was simulated and the correct diagnosis was made only after autopsy; in the second the etiological agent was recognized by the morphological and cultural characters of the yeast cells, 5 μ in diameter, found in the cerebrospinal fluid. The organisms from both cases were pathogenic to white mice, whether injected in cerebrospinal fluid or as cultures.

Fröhlich (W.), Zach (F.)., & Piringer (W.). **Über ein der Noma ähnliches Bild hervorgerufen durch Blastodendrion palati.** [On a syndrome resembling noma induced by *Blastodendrion palati*.]—*Arch. Derm. Syph., Berl.*, clxxix, 5, pp. 521–530, 8 figs., 1939.

German and Latin diagnoses are given of *Blastodendrion palati* n.sp., isolated on various standard media at the Vienna University Dermatological Clinic from a fatal case of blastomycosis, commencing with an abscess of the palate, in a 24-year-old man. The dimensions of the spherical, oval, ovate, or elliptical cells, staining red with Sudan III, varied with the medium, averaging 4·7 to 5·9 and 4·7 to 5·3 μ in diameter, respectively, on bouillon glucose peptone agar and carrot, the two most suitable substrata, at 37° C. On liquid media the cells were much larger, with diameters ranging from 6·5 to 15·2 μ. The thick-walled resting cells measured 6·7 to 8·7 μ. Intermingled with these

elements were numerous elongated cells and very long, filiform budding forms simulating a true mycelium. Gelatine was slowly liquefied, acid produced, and maltose and glucose fermented, but milk was not coagulated.

Fazakas (A.). **Pilzbefunde in den Tränenkanälchen, an den Augenlidern und den Lidrändern.** [Fungi detected in the lacrimal canaliculi and on the eyelids and their margins.]—*Klin. Mbl. Augenheilk.*, civ., 1, pp. 59–63, 1940.

Among the fungi observed by the writer in the course of ocular examinations at a military hospital at Debrecen, Hungary, were *Glenospora clapieri* [*R.A.M.*, xviii, p. 178], *Trichosporum rugosum*, *Monosporium* [*Scedosporium*] *apiospermum* [loc. cit.], *Schizosaccharomyces* [or *Mycoderma*] *hominis* [ibid., xvii, p. 242], *Scopulariopsis brevicaulis* [ibid., xvi, p. 179], *Haplographium de bella-marengoi* [ibid.; xvi, p. 253], *Hormodendrum algeriensis* [*H. pedrosoi*: ibid., xviii, p. 523; xix, p. 406], and *Cladosporium herbarum*, of which the first three each occurred in one case only and the remaining five species in 12, 4, 11, 2, and 6, respectively. In 47·7 per cent. of the cases the organisms were associated with some kind of pathological condition. Three cases in which the Meibomian glands of the eyelids were involved were found to be due to (1) *Microsporon felinum*, *T.* sp., and *Achorion* sp.; (2) *Acrothecium hominis*; and (3) *Acrostalagmus cinnabarinus* [ibid., xiii, p. 769].

Niño (F. L.). **Estudio de las lesiones producidas en el sistema ganglionar linfatico por le 'Paracoccidioides brasiliensis'.** [A study of the lesions produced in the ganglionar lymphatic system by *Paracoccidioides brasiliensis*.]—*Arch. Soc. argent. Anat. norm. pat.*, i, 4, pp. 221–231, 17 figs., 1939.

This is a detailed account of the histology of the lesions produced by *Paracoccidioides brasiliensis* in the human ganglionar lymphatic system in the Argentine [*R.A.M.*, xviii, p. 800].

Van der Walle (N.). **Coccidioidomycosis.**—*Ned. Tijdschr. Geneesk.*, lxxxiii (iv), 47, pp., 5548–5554, 1 pl., 1 graph, 1939. [Dutch.]

The author summarizes some important contributions to the literature dealing with *Coccidioides immitis* in California [see next abstract], and adds a note on the occurrence of *Paracoccidioides brasiliensis* [see preceding abstract] in Brazil, in which it is stated that the new name for the latter fungus is *Lutziomyces heterosporocellularis*.

Yegian (D.) & Kegel (R.). **Coccidioides immitis infection of the lung. Report of a case resembling chronic pulmonary tuberculosis.**—*Amer. Rev. Tuberc.*, xli, 3, pp. 393–397, 7 figs., 1940.

Coccidioides immitis was isolated on Sabouraud's medium (P_H 4) at 37° and on a liquid medium of sodium chloride, dextrose, and yeast extract (P_H 4) from the sputum of a 25-year-old woman at a New York hospital. The clinical history of the case suggested that infection was probably acquired before the patient's fourteenth year during a visit to the San Joaquin Valley, California [*R.A.M.*, xix, p. 472].

Batta (G.) & Fabry (L.). **La protection des sacs de Jute.** [The protection of Jute bags.]—*Chim. et Industr.*, xliii, 7, pp. 535–538, 1940.

In experiments conducted at the University of Liége, Belgium, untreated jute fibres suffered an appreciable diminution of strength from mould (*Penicillium*, *Aspergillus*, and *Mucor*) infection in less than a fortnight, whereas material impregnated with a commercial antiseptic [unspecified] was not attacked [cf. *R.A.M.*, xix, p. 95]. It is estimated that a trebled or quadrupled duration of life may be anticipated as a result of appropriate protective measures.

Barker (S. G.). **Deterioration of Jute.**—*Jute Rev.*, xiii, 139, p. 5; 140, p. 5, 1940.

Some of the information in this paper regarding the deterioration of the jute used for sandbags [see preceding and next abstracts] in England was placed at the author's disposal by [A. C.] Thaysen, of the Chemical Research Laboratory. In one test the periods (in days) of soil exposure required for the complete breakdown of jute samples shielded by glass, aluminium, rubber, and vaseline were 119, 105, 105, and 32, respectively, compared with 28 for the untreated. In active garden soil dew- and water-retted flax, hemp, jute, and cotton decayed in 20, 20, 21, 35, and 14 days, respectively, the rate of deterioration being roughly inversely proportional to the weights of the fabrics (4·42, 4·42, 4·42, 7·47, and 1·78 gm. per 100 sq. cm., respectively). It is thus apparent that jute is superior, from the point of view of resistance to rotting, to most of the other possible materials, besides being cheaper.

In another experiment in which jute wool sheets were exposed to the action of soil, the strongest protective influence was exercised by acetylation: this process conferred immunity from the complex of microbiological agents co-operating with climatic conditions to induce deterioration for a period of 2,645 days compared with 45 for the untreated control samples, a ratio of 58·8 : 1. Good results were also given by chromium/cutch, proflavine, acriflavine, and copper naphthenate [*R.A.M.*, xvi, p. 430], with protective prolongation ratios of 2·4 : 1 for the first three and 2·2 : 1 for the fourth. Resistance to sea water (tested in a few instances only) was strengthened by treatment with copper oleate (2·8 : 1) [ibid., xv, p. 505] and shielding with latex (2·1 : 1).

Rotting of Flax and Hemp fabrics.—*Jute Rev.*, xiii, 5, p. 13; 6, p. 13, 1940.

In connexion with Prof. Barker's investigations on the reaction of processed jute to fungal infection [see preceding abstract], some figures recently published by the German Fibre Research Institute relating to similar tests on flax and hemp are reproduced. Samples of sandbag fabrics made from flax and hemp tow yarns were (1) exposed to day and night weathering for six months at different places. Others were (2) stored in moist sand at 20° C. and a further lot (3) in an atmosphere of 80 to 90 per cent. relative humidity and a temperature of 18° to 20°, part of each lot being impregnated with copper sulphate and part left untreated. In lot (1) the first signs of mould appeared after one month and gradually increased until considerable infection was present at the end

of six months. In (2) the untreated samples were covered with fungi after one month and completely destroyed at the end of three months, while the impregnated, though severely attacked after three months, still showed adequate strength. As regards (3) the controls were heavily moulded after three months, while the treated samples remained free for six. There was no difference between flax and hemp in respect of resistance to fungal invasion, but the latter gave higher values than the former in bursting tests.

HAWKER (LILIAN E.). **Experiments on the control of basal rot of Narcissus bulbs caused by Fusarium bulbigenum Cke & Mass. with notes on Botrytis narcissicola Kleb.**—*Ann. appl. Biol.*, xxvii, 2, pp. 205–217, 1940.

In further experiments on the basal rot of narcissus (*Fusarium bulbigenum*) [*R.A.M.*, xv, p. 224] it was shown that rotting was favoured by high storage temperatures. Artificially infected bulbs of a number of narcissus varieties showed, after six weeks' storage, 6·9 per cent. losses in the shed (usually 0° to 17° C.) and 66·8 per cent. at 27°; artificially and naturally infected bulbs stored in a cool cellar (15° to 18°), in a shed (12° to 26°), and at 27°, showed 7·5, 12·4, and 22·7 per cent. losses, respectively. Bulbs infected with *Botrytis narcissicola* [ibid., xix, p. 97], on the other hand, showed heavier losses at lower than at higher temperatures. Rapid drying of the bulbs after lifting and after hot-water treatment reduced the rotting due to *F. bulbigenum*. In wet seasons drying is facilitated by partial cleaning of the bulbs soon after lifting. None of the bulbs thus cleaned showed any injury. After cleaning, bulbs should be stored under conditions of good ventilation at temperatures below 18°. In confirmation of the view generally held by the growers, late-planted bulbs gave poor stands in the field. The beneficial effect of early planting is ascribed to the fact that bulbs planted in September often experience lower temperatures than when kept in the warehouse. The addition of formalin (0·5 per cent.) or uspulun (0·25 per cent.) to the hot-water bath used as routine treatment to control eelworm [ibid., xviii, p. 653] or dipping in a cold solution of the former fungicide for five minutes after hot-water treatment, resulted in a reduction of the number of bulbs rotted during subsequent storage. This reduction was greater in bulbs free from eelworm. No adverse effects on growth and flowering were produced when the treatment was carried out at the correct time, namely, late August. Treatment with cold fungicidal steeps (0·5, 1·0, and 5·0 per cent. formalin, 0·1 per cent. mercuric chloride, 0·25 per cent. uspulun, or 0·25 per cent. aretan) or dusts (ceresan, improved ceresan, folosan, or brassisan, usually diluted to one-fourth with talc) soon after lifting also reduced rotting by *F. bulbigenum*, and had, with two exceptions (improved ceresan and 0·5 per cent. cold formalin), no harmful effect on growth or flowering.

DIMOCK (A. W.). **Epiphytotic of Botrytis blight on Gladiolus in Florida.**—*Plant. Dis. Reptr*, xxiv, 8, pp. 159–161, 1940. [Mimeographed.]

In March, 1940, the author received gladiolus plants from the vicinity of Bradenton, Florida, showing small, water-soaked lesions on the blossom petals (the tips of many of which were completely dried and

withered), light green or yellow spots about 1 mm. in diameter and with a reddish dot at the centre on the leaves, and sunken, brown lesions 1 to 4 by about 1 mm. on the stems. A *Botrytis* of the *cinerea* type was isolated from the material. The damage was reported to be very widespread, the grower who sent the specimens having lost at least 15,000 dozen gladiolus plants, while the same condition had developed on roses, camellias, gardenias, sweet peas, snapdragons [*Antirrhinum majus*], lettuces, cabbages, celery, and cauliflowers. In April a more severe outbreak occurred at Fort Myers, Florida. In conditions of high humidity and temperature the disease spread very rapidly over entire plantings in all stages of growth. This appears to be the first report of *Botrytis* blight on gladiolus in epidemic proportions in the United States.

Longrée (Karla). **Coniothyrium fuckelii Sacc. on Rose leaves.**—*Phytopathology*, xxx, 5, pp. 451–452, 1 fig., 1940.

In experiments at the New York (Cornell) College of Agriculture, young Joanna Hill rose leaves kept floating for seven days on a sucrose solution after inoculation with *Diplocarpon rosae* revealed the pycnidia of *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xvii, p. 600; xix, p. 348] within the black spot lesions. The fungus was isolated and inoculated into rose canes, on which it produced typical stem and graft cankers. Uninjured young Joanna Hill and Talisman rose leaves inoculated with *L. coniothyrium* were unaffected after a fortnight in environmental conditions favourable to the fungus, whereas those artificially infected with a mixture of *L. coniothyrium* and *D. rosae* spores bore pycnidia of the former intermingled with acervuli of the latter within the black spot lesions. Evidently, therefore, *L. coniothyrium* is capable of fruiting on rose leaves previously attacked by *D. rosae*.

Rosen (H. R.). **The Arkansas Rose-disease report.**—*Amer. Rose Annu.*, *1940*, pp. 119–122, 1940.

In experiments in the control of black spot of roses (Edith Nellie Perkins and Betty Uprichard varieties) [*Diplocarpon rosae*: *R.A.M.*, xviii, pp. 440, 598, and above, p. 519] at the Arkansas Agricultural Experiment Station in 1939 the incidence of infection was reduced from between 55 and 95 per cent. to 3 to 35, 1 to 30, and 5 to 10 per cent., respectively, by sulphur dust (kolotex), rose dust No. 1 (4 per cent. cuprocide G–A, 10 per cent. flour, 2 per cent. calcium arsenate, and 84 per cent. talc), and rose dust No. 2 (same as the preceding except for the replacement of the arsenate by talc). Kolotex caused slight burning on all the plots, while the copper oxide dusts were free from this drawback.

Breeding work for resistance to *D. rosae* is greatly complicated by regional inconsistencies in varietal reaction to the fungus, the repeatedly resistant Hybrid Wichurianas, Mary Wallace, Dr. W. Van Fleet, and Silver Moon, for instance, being quite susceptible in the Ozark district. So far, the few types and varieties showing uniform resistance are confined to the species roses and some of the *Rugosa* group.

Weiss (F.). **Anthracnose and Cladosporium stem spot of Peony.**—*Phytopathology*, xxx, 5, pp. 409–417, 1 fig., 1940.

A red spot disease of the stems, foliage, and flowers of peony, for which the writer in a previous note suggested the name of 'measles' (*Plant Dis. Reptr*, xvi, pp. 122–123, 1932), is stated to be prevalent in commercial plantings in the United States, sometimes seriously disfiguring the plants and destroying their value for cutting. The stem spots are raised, elliptical to elongated, usually discrete but occasionally confluent, 2 to 4 by 1 to 2 mm., while those on the leaves, floral bracts, and petals are much smaller, some mere flecks; all are of a uniform purplish- or brownish-red. Isolations from the diseased tissues of Avalanche peonies in a Pennsylvanian planting yielded *Cladosporium paeoniae* [*R.A.M.*, xviii, p. 478], *C. herbarum* [ibid., xvi, p. 464], a species of *Alternaria*, and *Glomerella* (?) *cingulata*, while stored stems kept outdoors or in a 10° C. chamber yielded in the late winter pycnidia of a fungus identified as *Pezizella lythri* [ibid., xi, p. 252], the imperfect stage of which is *Sclerotiopsis concava* (*Mycologia*, xiii, pp. 135–170, 1921), *S. testudinea* (ibid., xviii, p. 253, 1926) being probably a synonym. *S. concava*, also collected on several subsequent occasions in the field and isolated from the first red spots on peony stems in May, 1939, proved in inoculation experiments to be definitely parasitic, though the resulting symptoms, including stem collapse and the production of large, light brown foliar lesions bearing copious sporodochia of *Hainesia lythri* [ibid., xi, p. 252], were by no means characteristic of the disease as it occurs in nature. On the other hand, the typical features of red spot developed in plants inoculated with *C. paeoniae*, which was reisolated on maize meal agar, together with its *Pseudofumago* budding phase [ibid., ix, p. 346], from the lesions. In the latter stage the fungus is also pathogenic to peonies at a temperature range of 10° to 27·5° (optimum 18° to 22°), the dry, light brown spots on the leaves resembling those due to *Pezizella lythri*. It would appear from these results that *C. paeoniae* is the principal etiological factor in the development of red spot of peonies. Three outbreaks of the disease coincided with abnormally high spring temperatures. Infection is perpetuated chiefly by old diseased stems, and thick-stemmed varieties, such as Festiva Maxima and M. Jules Élie, appear to be much more resistant to red spot than weak-stemmed and medium or dwarf kinds.

Weiss (F.) & Smith (F. F.). **An incubating can for laboratory or field use.**—*Phytopathology*, xxx, 5, pp. 447–449, 1 fig., 1940.

Tin-plated or lacquered cans, fitted with vials buttressed with paraffin to form an even slope from the mouth of the vial to the bottom of the container, have been successfully used for incubating flowers inoculated with *Ovulinia azaleae* [*R.A.M.*, xix, p. 412] and are also applicable to experimental inoculations with other pathogens. A twig bearing one to four, usually two, flowers is inserted in the vial, which is filled with water from a rubber syringe, and a piece of paper towel placed on the bottom of the container to absorb excess water. Freshly cut flowers remained in good condition in the containers for 8 to 12 days, an ample period for the requisite observations.

Dodge (B. O.). **Fern diseases and pests.**—*J.N.Y. bot. Gdn.*, xli, 485, pp. 116–117, 1 fig., 1940.

Notes are given on the following prevalent diseases of ferns [*R.A.M.*, xvii, p. 462] in the United States: damping-off of the prothallia due to *Pythium*, *Rhizoctonia*, and *Botrytis* spp., the spores of which are perpetuated in the soil (and in the case of the first-named in water supplies originating in lakes or ponds); a yellowish-brown, jagged spotting of the prothallia caused by *Completoria complens* [ibid., xvii, p. 182]; reddish-brown or ashen, later brown lesions on the fronds due to various fungi, including *Cylindrocladium pteridis*, *Phyllosticta pteridis*, and *Alternaria polypodii* (the last-named producing zonate spots along the margins and forming tufts of loosely concatenate, brown spores); a species of *Taphrina* [ibid., xviii, p. 141] producing well-marked, yellow areas on both sides of the leaflets of Christmas fern [*Polystichum acrostichoides*], occurring occasionally from Maine to North Carolina and controllable (like the other leaf spots mentioned) by spraying with Bordeaux mixture; and black moulds (*Fumago* and *Teichospora* spp.).

Heim (R.). **Apparition de la rouille des Aloës à Madagascar.** [Appearance of Aloe rust in Madagascar.]—*Rev. Bot. appl.*, xx, 223, pp. 172–176, 2 figs., 1940.

Introduced species of aloes (*Aloë saponaria* and *A. thraskii*) in the Botanical Gardens at Antananarivo were found to be attacked by *Uromyces aloës* (Cke) P. Magn., a new record for Madagascar. Native aloes growing in the same rockeries were unaffected. On *A. saponaria* (which succumbs to infection) the fungus develops on the leaves, on which it produces round or oval, yellow spots, up to 5 cm. in diameter, bearing pustules arranged in broken, concentric circles. On *A. thraskii* similar effects are produced.

The teleutospores are generally globulose, oval, or irregularly subpolygonal, sometimes lozenge-shaped and elongated towards the apex, 31 to 44 by 28 to 34 μ. The pedicel is hyaline, 5 to 6 μ by up to 110 μ or more. The plasma is reddish-brown and granular. Repeated examination showed the presence of teleutospores only. Infection appeared to be associated with reduced resistance of the host due to re-transplanting, extreme drought, and nutritional deficiency.

Wilson (M.), Noble (M[ary]), & Gray (E. G.). **Blind seed disease of Ryegrass.**—*Nature, Lond.*, cxlv, 3681, p. 783, 1940.

After pointing out that blind seed disease of rye grass [*Lolium perenne* and *L. italicum*] has been present in Great Britain for at least four years, and (since the true perennials are very susceptible) is of considerable economic importance, the authors state that when Miss Noble's recent paper was written, describing a *Pullularia* on infected seed [*R.A.M.*, xix, p. 23], that by Neill and Hyde [attributing the blind seed disease to a fungus allied to *Helotium herbarum*: ibid., xviii, p. 601] was unavailable to her. The two fungi are, under certain cultural conditions, very similar, and it is thought advisable to record the fact that, in Britain, the blind seed fungus and the *Pullularia* sp. are often found on one and the same rye-grass seed.

Brown (B. A.). **Boron deficiencies in Connecticut.**—*Science*, N.S., xci, 2362, p. 338, 1940.

During the dry summer of 1939, the top leaves of lucerne at the Storrs (Connecticut) Agricultural Experiment Station turned yellow and the buds failed to develop into flowers on all the plots except those supplied with borax at the rate of 20 lb. per acre [*R.A.M.*, xvii, p. 398] in the previous August. At the second cutting the treated plants yielded 16 per cent. more than the controls, and chemical analyses revealed the following amounts of boron (p.p.m.): with borax, leaves 62 and stems 22; without borax, 21 and 16, respectively. Lucerne 'yellows' was further observed on several farms in the State during 1939, while another boron deficiency disease, internal cork of apples [ibid., xix, p. 416] was also reported in the same season.

Ayers (T. T.), Lefebvre (C. L.), & Johnson (H. W.). **Bacterial wilt of Lespedeza.**—*Tech. Bull. U.S. Dep. Agric.* 704, 22 pp., 13 figs., 1939. [Received July, 1940.]

A comprehensive account is given of the writers' studies on an apparently new bacterial wilt of *Lespedeza stipulacea* and *L. striata*, first observed at the Arlington Experiment Farm, Virginia, in 1937, and since then traced also to Missouri, Kansas, Illinois, Tennessee, and New York.

Dark, water-soaked spots on the leaflets are the first external sign of infection, rapidly followed by a greyish-brown discoloration, desiccation, and curling of the foliage, a thin incrustation of bacterial exudate sometimes covering the affected surfaces. Susceptible strains of the host succumb to the systemic invasion of the pathogen, which ensues soon after the premonitory symptoms. The stems of infected plants are liable to crack and extrude a yellowish drop of liquid which hardens. The organism isolated from the diseased tissues is named *Phytomonas lespedezae* n.sp. and described as a rod with rounded ends, occurring singly, in pairs, or occasionally in short chains, averaging 1·62 by 0·56 μ, motile by one polar flagellum, Gram-negative, aerobic, making the best growth between 30° and 35° C., and provided with capsules but no spores; on nutrient agar plates the bacterium forms circular, raised, glistening, translucent, viscid, yellow colonies, with entire margins; development is more copious on potato dextrose agar and potato cylinders; nutrient broth is clouded in 48 hours; gelatine, egg albumin, and blood serum are liquefied, milk peptonized, starch hydrolysed, and indol and hydrogen sulphide formed, but nitrates are not reduced and neither acid nor gas evolved from any of the carbohydrates tested.

Greenhouse inoculations showed the following annual strains of *L. stipulacea* to be susceptible: two of Early Korean, Harbin (all severely attacked), Late Korean (moderately), and Standard Korean (mildly); and *L. striata*, Tennessee (severely,) Kobe (moderately), and two of Common (one moderately to severely, the other mildly). So far perennial species have sustained no damage in the field, but the following were susceptible in inoculation experiments: *L. capitata*, *L. daurica*, *L. frutescens* [*L. violacea*], *L.* [*juncea* var.] *inschanica*, *L. procumbens* [*L. repens*], *L. sericea*, and *L. virginica* [*L. sessiliflora*]; on the other hand, a high degree of resistance was shown by *L. formosa* [*Desmodium*

formosum], *L. hirta* [*L. villosa*], *L. latissima*, and *L. thunbergii*. A strictly localized infection round the site of injury was the only response to inoculation with *P. lespedezae* of a number of other Leguminosae tested, including white sweet clover (*Melilotus alba*). Three methods of inoculation were successfully used on *L.* spp., viz., pricking the leaves with a needle dipped in a bacterial suspension, cutting seedling roots during immersion in the same, and cutting across the young leaflets, followed by immediate dipping in the suspension; atomizing with the latter resulted in infection only in the case of young seedlings with just the primary leaves exposed, the entry of the pathogen apparently being effected through the stomata. Once the parasite gains a foothold in a susceptible host it soon invades the vascular system and travels rapidly through the plant, obstructing the water-conducting vessels and causing wilting and death.

P. lespedezae was experimentally shown to occur both on and in the seed of the Early Korean variety of *L. stipulacea*, and in this way the pathogen may both persist in established fields (which it also does on diseased plant refuse) and be introduced into new areas. The use of healthy seed is thus the most urgent control measure, while the development, by selection or hybridization, of resistant lines from Standard Korean and Common may eventually have to be considered.

Marchionatto (J. B.). **Argentine Republic. Coryneum carpophilum on fruit trees.**—*Int. Bull. Pl. Prot.*, xiv, 5, p. 99, 1940.

Proof is stated to have been obtained by Clotilde Jauch in field and laboratory studies on the blight of stone fruits (peach, apricot, almond, plum, and cherry) in various localities of the Argentine Republic with widely differing climates that the causal organism belongs to the genus *Coryneum*. On the advice of other workers on the same fungus she proposes to rename it *Coryneum carpophilum* (Lév.) nov. comb. [syn. *Clasterosporium carpophilum* (Lév.) Aderh.].

Hopkins (J. C. F.) & Bacon (Aline L.). **Diseases of fruit, flowers, and vegetables in S. Rhodesia. I. Common diseases of Apples and their control.**—*Rhod. agric. J.*, xxxvii, 5, pp. 264–281, 4 pl., 1940.

This is a reprint of the authors' earlier paper on apple diseases and their control in Southern Rhodesia [*R.A.M.*, xvii, p. 755] with the addition of further information obtained during the past three years [ibid., xviii, p. 784; xix, p. 197], and a revised spray schedule.

Recommendations for the control of crown gall (*Bacterium tumefaciens*) [cf. ibid., xvii, pp. 508, 755] consist in planting only healthy nursery stock, soaking all new nursery stock for two hours just before planting (but not immediately after fumigation) in copper sulphate (7 oz. per 20 gals. water), uprooting and burning all infected trees (including stone fruits), or, if only slightly infected, removing the galls and painting the wounds with carbolineum, and soaking the soil from which diseased trees have been removed in formalin (1 in 25), leaving the hole unfilled for one year.

Root rot (*Sclerotium rolfsii*) is sometimes troublesome in nurseries where the soil is allowed to become too wet, but can generally be eliminated by improved drainage. Badly affected trees should be removed and burnt.

Carne (W. M.). **Australian Apples. A guide to picking for export or local storage and to the best shipping periods for export varieties.** —*Pamph. Coun. sci. industr. Res. Aust.* 95, 55 pp., 1 graph, 1940. [Photolithographed.]

The contents of this pamphlet embody an introductory note by W. M. Carne and five papers by the same author, some in collaboration with D. Martin and E. N. Robinson, which may be summarized as follows.

The incidence of storage and similar defects in apples is closely related to the average size of the fruit on a tree at the opening of the picking season. The larger the average size, i.e., the lighter the crop, the stronger is the tendency to the defects of the given variety. Small fruits of light crops are more liable to deterioration than those of heavier crops grown under comparable conditions. Such inherent defects cannot be avoided by earlier picking to prevent increase in size. Commercial experience has led to the acceptance as the standard size for any variety exported to the United Kingdom of the largest dimensions compatible with good keeping qualities, e.g., $2\frac{1}{4}$ in. for Cox's Orange Pippin, $2\frac{3}{8}$ to $2\frac{1}{2}$ for Jonathan and Cleopatra, and $2\frac{1}{2}$ to $2\frac{5}{8}$ for Granny Smith. Light-crop fruit has a shorter storage life and a briefer picking season than heavy-crop, and is never suitable for export. Carefully picked light-crop fruit (except very large individual apples) may be placed in cool storage for short periods and marketed direct from store. Before the picking season opens, all trees with about half a crop or less should be marked. The fruit should be picked early if the variety is subject to breakdown, late if susceptible to bitter pit, and towards the middle of the season if liable to both disorders. The optimum picking and shipping dates for Tasmanian apples are given.

The available knowledge concerning brown heart [*R.A.M.*, xvii, p. 463] is summarized. The safe concentration of carbon dioxide is about 10 per cent. up to a period of seven days, with lower concentrations for longer periods down to 3 per cent. for eight weeks. Normally it is desirable to aim at a maximum of 3 per cent. In 1939 the following percentages of severe brown heart were recorded for Tasmanian Sturmers picked on 17th April and stored in the presence of 5 per cent. carbon dioxide: after four weeks at 33° F., 0; after a fortnight at room temperature, 35; in 10 per cent. carbon dioxide under the same conditions, 8 and 52, respectively; the corresponding values for fruit picked on 12th May and similarly treated being 4 and 68, 52 and 84. The danger of using grid-cooled boats (the substitution for which of battery-cooled ships' holds is desirable, but at present impracticable) can be greatly minimized by picking the fruit during the first week of May and immediately storing it to await shipment.

Tables are given showing the recommended dates for the commencement of picking for export or local storage and for the export periods of apples from the six States of the Commonwealth.

Hill (H.) & Johnston (F. B.). **Magnesium deficiency of Apple trees in sand culture and in commercial orchards.**—*Sci. Agric.*, xx, 9, pp. 516–525, 4 figs., 1940.

During the past two years severe cases of magnesium deficiency have been observed in commercial apple orchards in Canada [cf. *R.A.M.*,

xviii. p. 743]. Early in August, 1938, typical symptoms were noted in one of the largest apple-growing centres in Quebec. Heavy, leaching rains had fallen at the beginning of the growing season. The condition was general throughout the district, and in many instances was very severe. The Melba variety was badly attacked, the symptoms being identical with those observed on this variety in sand culture experiments, viz., yellowing beginning round the leaf margins and spreading towards the midrib, the veins and a small area next to them remaining green, and the effect being one of radiating, narrow, green and wide, yellow bands. The yellow bands died and turned brown. On Fameuse and McIntosh apples marginal blotches and interveinal bands of necrotic tissue were more noticeable than interveinal bands of chlorotic tissue. By early September many of the older leaves showed large areas of dead tissue. Such leaves became rolled, and premature defoliation occurred. On Lawfam apples, interveinal chlorosis was followed by bleaching of the entire leaf, dead, necrotic areas occurring on the margin or in the centre.

The condition occurred on dark brown loam, very acid soils, occasionally with traces of podsolization, with a surface soil rich in organic matter and total nitrogen, low in calcium and magnesium, and with a satisfactory potassium level.

Leaves from affected trees had a very low magnesium content, a normal phosphorus and calcium content, and a rather higher potassium content than leaves from average normal trees. Evidence indicated that the condition may perhaps increase the susceptibility of apple foliage to spray injury. Soil applications of magnesium sulphate, sulphate of potash magnesia, and dolomite limestone did not affect the magnesium content of the leaf petioles or the terminal shoots or prevent the disorder from occurring in the year the applications were made.

Cass-Smith (W. P.). **Black spot or scab of Apples. Serious new outbreaks recorded in the Albany and Manjimup districts.**—*J. Dep. Agric. W. Aust.*, xvii, 1, pp. 56–67, 6 figs., 1940.

Apple scab, *Venturia inaequalis*, is stated to have been recorded now from all States of Australia [*R.A.M.*, xix, p. 104]. Serious new outbreaks occurred in a number of orchards in Western Australia during 1939–40, but owing to the disease being detected early measures were immediately and effectively carried out by the growers with the assistance of the Department of Agriculture. The following is a typical central programme: all trees in the infected area and the ground beneath were sprayed with home-made Bordeaux mixture 6–6–40 plus calcium caseinate, flour, or skim milk as a spreader, and a buffer area around the affected trees sprayed with Bordeaux mixture 3–5–50 plus spreader; all infected fruits and leaves were destroyed; after harvest, all trees and the ground beneath were to be sprayed with Bordeaux mixture 6–6–50; no fruit from the orchard to be allowed to leave it without permission from the inspector; early in April a cover crop of oats, rye, or barley was to be sown throughout the orchard to prevent diseased leaves from being blown about, the cover crop to be deeply ploughed under in autumn; in spring all trees in the orchard to be sprayed at (1) the 'spur burst' stage, when the tips of the young leaves

are showing, with Bordeaux mixture 5–4–50 plus spreader, (2) the 'pinking' stage of blossoming before the petals had opened with Bordeaux mixture 3–4–50 plus spreader, and (3) the 'petal fall' stage with Bordeaux mixture 2–5–50 plus spreader. It has been proved that infection is being introduced into Western Australia on young apple trees imported from the eastern States. It has now been arranged by the Department of Agriculture that all apple trees imported into Western Australia shall be dipped into Bordeaux mixture before being distributed to growers.

The development of the disease is favoured by fairly cool, moist weather during the growing season. The disease is undoubtedly capable of persisting under extremely adverse conditions. The following varieties of apples, listed in declining order of susceptibility, were found affected with the disease: Cleopatra, Granny Smith, Yates, Dougherty, Dunn's, Jonathan, and Delicious. All growers in the vicinity of the new outbreaks are urged to be constantly on the watch for symptoms and are advised to adopt as a precaution the control measures that have been applied in affected orchards.

Wormald (H.). **Storage scab of Apples.**—*Gdnrs' Chron.*, cvii, 2787, p. 257, 2 figs. (1 on p. 255), 1940.

In February, 1940, severe storage scab (*Venturia inaequalis*) was observed on Cox's Orange Pippin apples on removal from gas storage, conditions in which are evidently equally favourable for the development of the fungus with those of ordinary cold storage [*R.A.M.*, xiv, p. 111]. In addition to routine spraying in the orchard with Bordeaux mixture or lime-sulphur, followed if necessary by supplementary treatments with colloidal sulphur or sulphur dust, the removal of all surface moisture from the fruits before storage is an important means of combating this phase of scab.

Keitt (G. W.) & Langford (M. H.). **A preliminary report on variability and inheritance in Venturia inaequalis.**—*Phytopathology*, xxx, 5, pp. 452–453, 1940.

At the University of Wisconsin the eight ascospores of each of four asci of *Venturia inaequalis* were isolated in the order of their occurrence in the ascus and grown on malt agar through twelve consecutive monoconidial transfers made at two-monthly intervals. The distinctive morphological characters of the thalli remained fairly constant in culture. Each set of eight isolates contained four pairs behaving alike, indicating that the third nuclear division in the ascus is equational.

The pathogenicity of all the cultures on nine apple varieties remained relatively constant during two seasons under approximately identical environmental conditions. In *in vitro* cultures of the ascigerous stage of the fungus, the 32 isolates of the four sets fell into two groups of 16 each for sexual compatibility, being self- and intra-group sterile and inter-group fertile [cf. next abstract]. Segregation for this factor took place alternatively in the first or second nuclear division of the ascus [*R.A.M.*, xvi, p. 684]. The occasional sectors developing in culture [ibid., xv, p. 30] grew faster, produced fewer conidia, and were less pathogenic than the parent isolates. One induced white lesions on

apple leaves. In several instances a sector and its parent isolate were separately paired *in vitro* with the same compatible isolate. The ascocarps from matings between the parent isolates contained eight-spored asci, whereas those from two pairings involving sectors were occupied by four-spored asci, denoting a difference in genetic constitution between the parents and saltants.

Langford (M. H.) & Keitt (G. W.). **Heterothallism in Venturia pirina.** —*Phytopathology*, xxx, 5, p. 452, 1940.

The eight spores of each of five asci of *Venturia pirina* were isolated in the order of their occurrence in the ascus and grown *in vitro* at the University of Wisconsin. Petri dishes containing 20 c.c. each of 0·5 per cent. malt extract agar plus a decoction of dead pear leaves were sown with conidia of these isolates, singly and in every possible combination within each set of eight, similar sowings being made on sterilized dead pear leaves in test tubes with a few c.c. of malt extract decoction. The cultures were incubated for four months at temperatures conducive to perithecial development.

All the isolates were hermaphroditic and self-sterile [cf. preceding abstract]. Each set consists of two groups of four isolates each, intra-group sterile and inter-group fertile. Segregation for sexual compatibility occurred alternatively in the first or second nuclear division in the ascus. Matings of the isolates between certain sets disclosed only two compatibility groups.

Anderson (H. W.). **Recent developments on eradicant sprays.**—*Trans. Ill. hort. Soc.*, lxxiii (*1939*), pp. 235–247, 1940.

In experiments with eradicant sprays carried out in Illinois, Montmorency and Early Richmond sour cherries were given (26th April, 1939) a 'floor' spray of 2 per cent. elgetol [*R.A.M.*, xix, p. 353] applied at the rate of about 1,400 gals. per acre. On 30th June, only 3·5 per cent. of the leaves on the sprayed trees showed infection by *Coccomyces hiemalis*, as against 43 per cent. for the unsprayed controls. No noticeable leaf fall occurred on the sprayed trees until the middle of August, by which time the controls had developed secondary infection and showed general defoliation.

Thornberry (H. H.). **Virus diseases of the Peach.**—*Trans. Ill. hort. Soc.*, lxxiii (*1939*), pp. 247–252, 1940.

Chokecherries (*Prunus virginiana*) in Illinois have been observed to show a condition apparently identical with the yellow-red virosis or 'X' disease of peaches [*R.A.M.*, xix, pp. 292, 484] reported from Connecticut, Massachusetts, and New York. On chokecherry the disease is also present in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, and Wisconsin. The symptoms differ from those of winter injury in that one or more branches may be reduced in growth, while others remain normal, the trouble not affecting the whole tree as in the latter condition. The disease appears to spread more rapidly on chokecherries than on peaches. In Illinois most of the chokecherries are confined to the north of the State, where there are no commercial peach orchards.

Hopperstead (S. L.) & Kadow (K. J.). **Studies on the control of the Peach leaf curl.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 102–103, [? 1940].

Peach trees in Delaware sprayed on 3rd March, 1939, when the buds had just started to swell, with Bordeaux mixture 6–6–100, 4–4–100, 2–2–100, 1–1–100, and coposil 2–100, showed on 13th May 4·3, 17·8, 24·5, 31, and 32·1 per cent. leaf curl (*Taphrina deformans*) [*R.A.M.*, xix, p. 263], respectively, as against 59·8 per cent. for the untreated controls. Observations in commercial orchards indicated that poor control resulted when sprays were applied after the buds had begun to swell. The disease can be completely controlled in any season, provided each twig, branch, and trunk is completely covered with proper spray material before the buds begin to swell.

Siegler (E. A.). **Crown gall of Peach in the nursery.**—*Phytopathology*, xxx, 5, pp. 417–426, 2 figs., 1940.

Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) is stated to be one of the most serious diseases of nursery peaches, especially in alkaline soils [*R.A.M.*, xviii, p. 158]. Experiments at the Beltsville (Maryland) Horticultural Station in 1939 confirmed previous observations to this effect, the incidence of infection in artificially inoculated limed plots averaging 59 per cent. compared with 9 in the untreated controls. In a test in which pits were dipped before planting in an aqueous suspension of calomel [mercurous chloride] at the rate of 4 oz. per gal., the seedlings from the disinfected material developed only 6 per cent. crown gall as against 71 per cent. in four control plots.

The practice of planting seed after sprouting is another important contributory factor in crown gall formation, though even where the pits are planted in the autumn and allowed to germinate *in situ*, the numerous small lesions occurring on the tender tissues in the early stages of growth appear to act as foci of infection; hence the location of the majority of the excrescences in the region of the root-stem junction.

Asghar Ginai (M.). **A species of Phyllactinia occurring on Almond (Prunus amygdalus).**—*Indian J. agric. Sci.*, x, 1, pp. 96–97, 1 pl., 1940.

A species of *Phyllactinia* observed causing mildew of almond leaves and young twigs in the Quetta Valley is identified as *P. salmonii* (syn. *P. corylea* (Pers.) Karst. vars. *angulata*, *rigida*, and *subspiralis* Salmon), described by Blumer [*R.A.M.*, xiii, p. 128] as attacking *Paulownia imperialis* in Japan. The disease first appears at midsummer. Severe attacks (which are rare) induce fragility and slight distortion of the leaves, sometimes accompanied by destruction of the parenchyma and copper discoloration. Sweet almonds are more susceptible than the bitter varieties.

Hienton (T. E.) & Fawcett (K. I.). **Precooling tests of Indiana Strawberries, Cantaloupes, and Peaches.**—*Bull. Ind. agric. Exp. Sta.* 439, 36 pp., 13 figs., 8 graphs, 1939.

In tests in which strawberries were despatched from Pekin, Indiana,

to St. Paul, Minnesota (25½ hours' transit), it was found that fruit shipped in a railway car pre-cooled to 45° F. arrived in excellent condition and showed 1 per cent. decay, as compared with 2 to 3 per cent. decay in a non-pre-cooled car. High initial fruit temperatures should be avoided by picking early in the day and keeping the fruit shaded until it is loaded. Directions are given for adjusting the proportions and quantities of ice and salt to give the best rate of fall of temperature according to conditions at any time.

Tests were also made of the effect of pre-cooling on the development of brown rot [*Sclerotinia fructicola*] in peaches during transit [*R.A.M.*, xviii, p. 535]. In this case it was found that development and spread of brown rot in fruit cooled to below 50° is very slow, being held in check for three days at 45° and four at 41°. Ventilated baskets permit rapid cooling. Pre-cooling makes it possible for the grower to delay harvesting until fruit is fully developed in quality and appearance.

Temple (C. E.). **Red stele rot of Strawberry.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 141–149, [? 1940].

Strawberry 'red stele' root rot [*Phytophthora*: *R.A.M.*, xix, p. 107], during the twenty years or so since it was first observed in Scotland, has been reported from 14 of the United States of America and is doubtless present in others. The nursery regulatory services of the States affected are determined to end the movement of infected plants.

In Maryland legislation provides for thorough and repeated inspection of the fields and release of plants only by certification under very strict conditions; this system has given good results after operating for a year. Growers are urged to plough under infected plants as soon as crop failure becomes apparent. Infected fields should not again be planted to strawberries.

In one year's tests the Aberdeen, Beauty, and Pathfinder varieties were found to be highly resistant (possibly immune), and Dunlap (?), Cooper, Gibson, Marshall, Mastodon, Wayzata (Rockhill), Illinois Selection, and New Jersey No. 255 resistant. The Aberdeen variety appears to transmit high resistance to a large proportion of its progenies when crossed with susceptible varieties. In co-operative work between Maryland University and the United States Department of Agriculture about 5,000 hybrid clones have been obtained, one parent of each of which is resistant or immune. These plants are growing in infected soil in two localities and should give valuable new resistant varieties.

Wilcox (Marguerite S.). **Diaporthe vaccinii, the ascigerous stage of Phomopsis, causing a twig blight of Blueberry.**—*Phytopathology*, xxx, 5, pp. 441–443, 2 figs., 1940.

Maize meal agar cultures of *Phomopsis vaccinii*, the imperfect stage of *Diaporthe vaccinii*, from naturally and artificially infected blueberry (*Vaccinium corymbosum*) and decayed cranberry fruit [*R.A.M.*, xviii, p. 403], were left out of doors at the Beltsville (Maryland) Horticultural Station from October, 1938, until February, 1939, when all bore occasional small, thick, stroma-like bodies, black on the exterior, partly or wholly embedded in the substratum and containing *Phomopsis* pycnidia and *Diaporthe* perithecia, either together in the same stroma or in

separate stromata. Perithecia-bearing stromata continued to form for some months in these cultures in a refrigerator at 8°, and single-ascus transfers from cultures from spontaneously blighted blueberry shoots later produced the perfect stage (not hitherto observed in nature) at room temperature.

Both the stromata and perithecia of the blueberry isolate appear to agree with Shear's description of *D. vaccinii* [ibid., xi, p. 188]. The asci are oblong, fusoid, sessile, with narrow pores, 32 to 48 by 5·8 to 9·6 μ, containing bicellular, biguttulate spores, 6·4 to 12·8 by 2·5 to 4·2 μ; the elongated, thick-walled ostioles are copiously furnished with upward-tending hairs. The asci of the pathogen isolated from cranberry measured 35 to 45 by 6·4 to 9 μ, and the spores 6·4 to 11·6 by 3·2 to 3·8 μ.

De La Hoz (C.). **El problema Bananero. Tratamiento de la Sigatoka.** [The Banana problem. The treatment of 'Sigatoka' disease.]—*Rev. agríc., Guatemala*, xvii, 3, pp. 98–101, 1940.

Directions are given for the adaptation of Ward's method of combating *Cercospora musae* on bananas in Jamaica with Bordeaux mixture or dust [*R.A.M.*, xviii, p. 328] to Guatemalan conditions [ibid., xviii, p. 124].

Simmonds (J. H.) & Mitchell (R. S.). **Black end and anthracnose of the Banana with special reference to Gloeosporium musarum Cke and Mass.**—*Bull. Coun. sci. industr. Res. Aust.* 131, 63 pp., 2 pl., 1 graph, 1940.

This is a comprehensive account of investigations carried out in Queensland on black end and anthracnose of banana [*R.A.M.*, xii, p. 40; xix, p. 106] for the Australian Council for Scientific and Industrial Research. The fungus *Gloeosporium musarum* is stated to be the sole cause of anthracnose and the most important of all fungi associated with black end. It causes losses throughout the year and is responsible for the epidemic development of both diseases during the summer months. A similar but less serious type of black end is produced by *Nigrospora sphaerica* [loc. cit.] during the winter and spring months, and a still less important one by *Fusarium* spp. [loc. cit.] in fruit roughly handled or over-ripe at the time of packing.

Infection by *G. musarum* takes place while the fruit is still on the plant, the spores from the acervuli on dead leaf bases being transmitted by rain. In the laboratory, spores dried singly survived for only a short time, but when allowed to remain in a mass in the acervulus some of them would germinate after about 8½ months. The optimum temperature for the growth of *G. musarum* varied from 28° to 30°, falling with the progressive age of the culture; growth ceased at about 37° and was very scanty below 15°. Spore formation was abundant within the range from 25° to 34·5°, diminishing with lower temperatures and finally ceasing at 15°. Spore germination took place satisfactorily between 19° and 36°, but was best at the range of temperatures optimal for growth. It is suggested that high temperatures should be avoided for ripening, and that in warm summers harvested fruit should be

transported to the ripening rooms as quickly as possible and kept as cool as practicable during transport. Infection in the field depends largely on conditions of high temperature and humidity which prevail in Queensland during January and February. More severely affected fruit occurred on badly kept plantations. Incidence of infection was found to be correlated with the number of dead leaves left on the plant. The presence of waste fruit and bunch stalks inside or near the packing shed is likely to result in some additional infection during packing. The slightly smaller, normal summer fruit, which matures during December, January, and February, particularly that with long stalks, is somewhat more susceptible to the fungus than the larger type maturing in March. Fruit of the so-called 'mixed ripe' stage showed 43·2 and 79·7 per cent. severe black end and anthracnose, respectively, as compared with 5·1 and 13·9 per cent. in the normal full [not so ripe] fruit. Fruit should not, therefore, be picked too late. There was little varietal difference in susceptibility in the wounded fruit of Veimama and Cavendish bananas, but the uninjured skin of the former variety was slightly more resistant.

Infection during packing and transport can be avoided by careful handling and by packing in small clusters of four or six to avoid bending or splitting of the fruit stalk. Observations in the ripening rooms showed that fruit ripened quickly escaped practically all black end except that initiated by injury or an over-ripe condition.

None of the fungicides used in spraying and fumigation trials gave satisfactory control. Immersion in various strengths of Shirlan AG resulted in only a moderate reduction of black end of the *G. musarum* type, but gave good control of *N. sphaerica*. It is considered that commercial control of black end can only be achieved by observing plantation hygiene and maintaining the conditions outlined above during transport and ripening. Investigations into the method of infection by *G. musarum* indicated that the appressoria of the fungus may be more resistant to chemicals than the spores; a form of latent infection was demonstrated which may also possibly play a part in the failure of fungicidal treatments.

Crandall (B. S.). **Known range of Persimmon wilt in 1939.**—*Plant Dis. Reptr*, xxiv, 9, pp. 168–169, 1 map, 1940. [Mimeographed.]

In addition to States already reported to harbour the *Cephalosporium* wilt of persimmon (*Diospyros virginiana*) [*R.A.M.*, xviii, p. 537], recent (1939) surveys for the disease revealed its presence in Texas. The disease is characterized internally by fine, brownish-black streaks in the wood, and externally by a sudden foliar wilting, beginning with the upper branches and eventually spreading over the entire tree. The small chlorotic leaves occasionally borne in the spring by trees infected during the previous year gradually droop and fall in the early summer. Diseased trees usually die by the late summer, when masses of the salmon-pink spores of the causal organism are produced between the bark and the wood. Typical spore production also takes place in cultures of the fungus on artificial media in a week or ten days. *D. lotus* and *D. kaki*, both of Asiatic origin, have been found highly resistant to the wilt disease.

Manns (J. F.). **Modern spraying and dusting outfits.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 42–45, 4 figs., [? 1940].

A note is given describing a new mechanical spraying apparatus named 'speed sprayer', invented by G. W. Daugherty and marketed by the Superior Spray Machine Company, Orlando, Florida, in which the spray material is broken into a mist and directed on to the plants to be sprayed by a propeller, like that of an aeroplane, with adjustable blades. It is claimed that this machine forces the spray through trees with thick, heavy foliage and enables 50 to 75 acres of orchard to be sprayed per day. Some details are also given of the experimental use of the aeroplane in dusting and spraying.

Pasinetti (L.). **Contributo allo studio dei composti fenolmercurici e tiofenoli come veleni protoplasmici nella lotta anticrittogamica.** [A contribution to the study of phenolmercuric and thiophenol compounds as protoplasmic poisons in fungicidal control.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 137–148, 1940.

In laboratory tests with six products, in which the two chief components consisted of a phenol derivative (e.g., parachlorophenol) and a mercury or sulphur derivative, evidence was obtained that it is possible to increase appreciably the fungicidal toxicity of certain organic compounds by associating them with organic or inorganic mercury salts or sulphur. The data also supports the hypothesis that the stimulating effect of mercury on plant growth is a physico-chemical action of a transitory nature.

Darker (G. D.). **A brief host index of some plant pathogens and virus diseases in Eastern Asia.**—*Plant Dis. Reptr, Suppl.* 122, pp. 93–123, 1940. [Mimeographed.]

This abridged index, arranged under the host names in alphabetical order, of bacterial, fungal, miscellaneous, and virus diseases of plants in Eastern Asia has been compiled from Merrill and Walker's 'A Bibliography of Eastern Asiatic Botany', Arnold Arboretum of Harvard University, 1938.

Baker (R. E. D.). **Distribution of fungous diseases of crop plants in the Caribbean region.**—*Trop. Agriculture, Trin.*, xvii, 5, pp. 90–94, 1940.

A list, based on replies to a detailed questionnaire and intended to be of use mainly for plant quarantine purposes, is given of the chief fungal and bacterial diseases of exclusively tropical crops in the Greater and Lesser Antilles. The entries are arranged under hosts. No doubtful records are included, the localities in which each disease definitely is or is not present being clearly shown.

Gardner (H. A.) & Hart (L. P.). **Recent mildew tests in Florida.**—*Circ. Amer. Paint Varn. Mfrs' Ass.* 574, pp. 28–32, 1939. [Abs. in *Build. Sci. Abstr.*, N.S., xiii, 5, p. 70, 1940.]

In continuation of previous experiments, white lead, leaded zinc, zinc sulphide, magnesium and lead, zinc, and titanium white paints and commercial red and green paints containing a number of different

fungicidal constituents have been subjected to severe conditions of exposure in Florida [*R.A.M.*, xvii, p. 830]. The results of the tests indicated that white lead paints require a very strong disinfectant to prevent mildew, to which those containing zinc oxide, however, are less susceptible. This compound, or others of equivalent toxicity, should be freely incorporated in red and green paints to confer protection from fungal infection.

Report of Proceedings, Third International Congress for Microbiology, New York, 1939.—xi+883 pp., New York, International Association of Microbiologists, 1940. $5.

In this report [cf. *R.A.M.*, xvi, p. 482] it is stated that at the Third Congress of the International Society for Microbiology, held in New York in September, 1939, the following recommendations of the Permanent Committee on Nomenclature were accepted. A recognized bacteriological code shall be developed tentatively, and its publication authorized, in the hope that the question may be finally settled at the next Congress. The Nomenclature Committee shall continue to function as at present constituted, under the auspices of the International Association of Microbiologists. The functions of the International Committee on Bacteriological Nomenclature and its Judicial Commission are defined. When any microbiologist considers desirable a particular interpretation of any rule or recommendation of nomenclature he should submit a brief on the matter to the Chairman of the Judicial Commission; an opinion will then be formulated, which may not be issued until approved by eight members of the Commission.

Among the many papers communicated the following may be mentioned. R. E. Buchanan (p. 156) states that the bacteriological code in question adapts the botanical code to the characteristics of bacteria, with the following modifications: later homonyms of generic protozoological names introduced into bacteriology are invalid; names of genera and subgenera are of equal value, as are those of species and subspecies; all references to the naming of hybrids are eliminated; and botanical are replaced by bacteriological examples.

W. H. Burkholder (p. 163), discussing the relationships of the phytopathogenic bacteria [ibid., xix, p. 203], states that these organisms do not constitute a natural division separated from other members of the Eubacteriales. They may be divided into four or five groups, referable to an already existing genus of Bergey's classification or to a closely related genus. Most of them are closely related to non-sporeformers of the soil. The members of *Erwinia* resemble species of *Aerobacter*. Some 75 species of *Phytomonas* are related to *Pseudomonas fluorescens* and should be combined with *Pseudomonas*. The pathogens causing plant hypertrophies resemble *Bacterium radiobacter* and the members of *Rhizobium* [ibid., xix, p. 461]. The wilt-producing bacteria show certain relationships with *Rhizobium*, but might be placed in another genus. Some 40 closely related species, of which *Phytomonas campestris* is representative, require a new generic name [cf. ibid., xviii, p. 659].

C. Thom (p. 187), dealing with *Aspergillus-Penicillium* relationships, concludes that *Aspergillus* and *Penicillium* become almost inextricably involved when numerous variants are compared. Some of these

variants pass into the *Gymnoascus* type of fruiting so completely that the line dividing families must be arbitrarily drawn rather on general strain morphology than on definite diagnostic characters.

C. Naeslund (p. 189), Miss D. Erikson (p. 192), and V. Puntoni (p. 195) discuss the classification of the Actinomycetes.

Dealing with the taxonomy of the anascosporous yeast-like fungi, N. F. Conant (p. 198) states that in the search for a single generic term for these fungi, *Syringospora* Quinquaud 1868 and *Parendomyces* Queyrat and Laroche 1909 must be given careful consideration, because of priority. *Mycotorula* Will 1916 or *Candida* Berkhout 1923 could be retained only by the establishment of either as a *nomen conservandum*.

Rhoda W. Benham (p. 200) produces evidence to show that *Monilia* [*C.*] *albicans*, *M.* [*C.*] *parapsilosis*, *M.* [*C.*] *krusei*, and *M. mortifera* [ibid., xvi, p. 811] are distinct species. Strains of *C. albicans* varied both in morphology and virulence, and it is suggested that *Mycotoruloidea ovalis*, *Monilia stellatoidea* [see above, p. 534], and possibly *Monilia candida* [*C. vulgaris*] are variants of *C. albicans*.

W. D. Stovall (p. 202) states that the classification of fungi known variously as Castellani fungi, yeast-like fungi, and *Monilia* is much confused, due in part to lack of uniformity in the conditions under which the organisms were cultured. In studies of over 1,000 cultures from various sources, the morphology of the colony, when grown for 24 hours at 37° C. on malt agar, differentiated three species, mainly in radial striations. Fermentation in 1 per cent. maltose and 1 per cent. saccharose beef infusion broth incubated for 48 hours at 37° also indicated three species. Coagulation of calcium lactate milk was accomplished in 24 to 48 hours only by [*C.*] *albicans*, but with longer incubation periods, occasionally a strain of [*C.*] *parapsilosis* produced this reaction. None of the organisms liquefied gelatine. The organisms also showed differences in pathogenicity when given intravenously to rabbits, type I (*C. parapsilosis*) showing no pathogenicity, type II (*C. albicans*) being pathogenic, and type III (*M. candida*) [*C. vulgaris*] feebly pathogenic. Serological studies showed a characteristic difference between type I and the other two species. *C. albicans* and *C. vulgaris* showed no distinguishing antigenic differences.

Joanna Westerdijk and H[armanna] A. Diddens (p. 204) list the methods used at Baarn to prevent the occurrence of variations in the type culture collection. These include the greatest possible frequency of transfer, growing at 12° to 17° in a diffused light, choice of several suitable nutrient media, and their low concentration and changing.

H. E. Prince, Marie B. Morrow, and E. P. Lowe (p. 270) produce evidence indicating that air-borne moulds cannot be disregarded as potential etiological agents in respiratory allergic reactions.

W. M. Stanley (p. 43) discusses the properties of viruses. J. Henderson Smith (p. 277) points out that although some at least of the plant viruses are nucleoproteins with large molecules, the number of viruses shown by detailed analysis to be really proteins is still very small.

F. C. Bawden and N. W. Pirie (p. 279) tabulate the elementary analyses of six virus proteins, tobacco mosaic, cucumber virus 3, potato virus X, potato virus Y, bushy stunt, and tobacco necrosis. The first four have asymmetrical particles: dilute solutions show anisotropy of flow,

while concentrated solutions are liquid crystalline. The first two give needle-shaped paracrystals, the second two amorphous precipitates, when precipitated with acid or salts. The last two give isotropic solutions: they are soluble at their isoelectric points and when precipitated slowly with salts form true crystals. These viruses are doubly crystalline, in the sense that the particles arrange themselves regularly to form visible crystals or liquid crystals, and the units constituting the particles are also arranged with a three-dimensional regularity. The purified viruses differ most markedly from recognized organisms in their chemical simplicity and orderly structure.

K. M. Smith and W. D. MacClement (p. 312) state that the difficulty of recovering viruses by inoculating plants with the juice of viruliferous insects is due to the presence of inhibitors in the insects. In their experiments they found that all plant viruses tested in low concentrations were destroyed after ingestion by the caterpillar *Protoparce sexte*, while the only virus recovered after feeding it in high concentration was that of tobacco mosaic. Caterpillars survived injection with 2 c.c. of a concentrated solution of tobacco mosaic virus, but no evidence has so far been obtained that this enables them to effect transmission. By using the vector of sugar beet curly top virus [*Eutettix tenellus*] to recover this non-sap-transmissible virus from injected caterpillars it was established that injected curly-top virus persisted in the blood of caterpillars.

W. Carter (p. 313) adduces further evidence that the functions of the symbionts of *Peregrinus maidis* are not directly related to those of the virus of maize mosaic.

L. O. Kunkel (p. 315) states that tobacco mosaic virus mutant K20 caused filiforming of the leaves at all seasons and under various growing conditions. Mutant K23 produced a yellow mosaic with an orange shade and ring spot lesions on tobacco leaves, and gave rise to substrain K23–D1, which caused necrosis of tobacco without chlorosis. This substrain moves readily in tobacco plants and is highly infectious; it can very satisfactorily be used in cross-immunization experiments in tobacco.

H. H. McKinney (p. 316) states that in his investigations rapid domination of one virus over another occurred consistently only when the suppressed virus was a direct-line mutant from the dominating virus. With two primary mutants from the same virus domination was either quantitative with regard to time, or erratic. *Nicotiana* virus 6 and a yellow mosaic mutant from *N.* virus 1 induced local necrotic lesions on the leaves of Maryland Medium tobacco and *N. sylvestris*. The number of lesions of *N.* virus 6 per unit area of leaf was reduced, and the appearance of lesions was delayed, as compared with the controls, when the test plants carried *N.* virus 1, a mild green mosaic mutant from *N.* virus 1, potato virus Y, or cucumber mosaic (Doolittle's type), celery mosaic, potato veinbanding mosaic viruses. With the yellow mosaic mutant, *N.* virus 1 consistently afforded complete protection against lesions even in the very young leaves of both hosts. The mild green mutant gave complete protection in *N. sylvestris*, but in Maryland Medium it sometimes gave complete, and sometimes partial protection. In all instances, the cucumber, celery, and potato viruses gave partial pro-

tection. A ring spot virus also reduced the number of lesions produced by the yellow mosaic mutant. Assuming that degrees of protection indicate degrees of relationship all the mosaics studied are related and the ring spot virus is related to the mosaic viruses.

K. Silberschmidt (p. 329) states that potatoes degenerate very rapidly in Brazil, where old, indigenous varieties do not exist locally. Many wild Solanaceous plants occur as common weeds in the potato field [ibid., xix, p. 234].

A. L. Carrión (p. 505), from eight years' study of fungi isolated from cases of chromoblastomycosis in ten different countries, concludes that they should all be classified as *Phialophora verrucosa* [ibid., xix, p. 406], *Fonsecaea pedrosoi*, or *F. compactum*.

W. A. E. Karunaratne (p. 507) states that in Ceylon rhinosporidiosis [*Rhinosporidium seeberi*: ibid., xv, p. 803; xix, p. 218] is widely distributed and is about eight times as common among Moors as among Sinhalese. The direct evidence in favour of trauma as an etiological factor is slight, but there is much indirect evidence in support of it. Further evidence has confirmed the possibility of local epithelial infection by spores, and, in the author's opinion, such local infection may occur in the absence of recognizable trauma.

P. Negroni (p. 508) described the cultural characters of *Histoplasma capsulatum* [ibid., xix, p. 472] isolated from the first South American case of histoplasmosis in 1937. The fungus forms small spores 1·9 to 4·6 μ in diameter, and verrucose, globose, or piriform hypnospores measuring 7·5 to 28 μ in diameter.

P. Radaelli and P. Ciferri (p. 509), referring to their erection of the monotypic family Histoplasmaceae among the anascosporic yeasts for the genus *Histoplasma* [ibid., xvii, p. 816], state that in addition to the type species, *H. capsulatum*, *H. farcinimosum* and *H. muris* have been added. The life-history of the first two cultivated species is revised, and the absence of a perfect stage confirmed. The parasitic stage is represented by small, yeast-like, budding cells multiplying only in the macrophagic cells of the reticulo-endothelial system in man and laboratory animals. The saprophytic stage comprises two fundamental types, one with a poorly developed mycelium and, rarely, small blastospores, and the other with a well-developed mycelium and clubbed or spherical chlamydospores.

A. Howell (p. 509) states that the optimum temperature for the growth and sporulation (on potato maltose agar) of the saprophytic phase of *H. capsulatum* is 25°, and the maximum growth temperature is between 30° and 37°, while the optimum hydrogen-ion concentration of the medium is approximately P_H 6·5 to 7·5. Comparative data are given for *Sepedonium chrysospermum*, *S. xylogenum*, and *Stephanoma tetracoccum* [ibid., xviii, p. 457].

R. V. Talice and J. E. MacKinnon (p. 510) adduce evidence that *Sporotrichum asteroides* is synonymous with *Rhinocladium schenckii* [*S. schenckii*: ibid., iv, p. 283; xvi, p. 608].

C. W. Emmons (p. 511) states that the existence of a large number of species of dermatophytes is probably an expression of their mutability, which is capable of demonstration by observation of intergrading forms among strains, by the spontaneous appearance of mutants,

and by stimulation of mutation by ultra-violet radiation [ibid., xix, p. 215].

D. S. Martin (p. 516) presents data illustrating the value of serologic methods in the study of certain fungal infections.

In the symposium on host-parasite relationships several papers deal with the comparison of processes in fungal infections of plants and animals. G. H. Coons (p. 523) deals with etiology and pathogenesis in plants, J. C. Walker (p. 525) with tissue reactions in plants, J. G. Hopkins (p. 526) and E. C. Stakman (p. 527) with resistance and immunity in animals and plants, respectively.

J. N. Couch (p. 527) states that scale insects are not infected directly by the basidiospores of *Septobasidium curtisii* [ibid., xviii, p. 59], but by smaller bud cells from the spores. Infection generally occurs through the legs or antennae, but sometimes directly, through the body wall. In *S. schweinitzii* the process is similar. In *S. apiculatum* neither the spores nor the bud cells appear to cause infection. The infected insect may remain at home, crawl to another fungal-insect colony, or settle on the clean bark and start a new colony. Haustoria develop only in the haemocoel and do not attack the vital organs of the insect. Parasitized insects outlive healthy ones but are dwarfed, and do not reproduce. Male insects do not become infected.

C. Drechsler (p. 528) states that approximately 75 terrestrial fungi are known to destroy the microscopic terricolous animals infesting old agar cultures from decaying plant material. Of these, 40 destroy soil-inhabiting rhizopods, and of the 40, 35 belong to the Zoopagaceae [ibid., xix, p. 472], a family with about twice as many predacious as parasitic members, and with three nematode-destroying forms, of which two are predacious while the third is parasitic. The conidia of the two predacious species are more than 1,000 times as bulky as those of the parasitic species. Attachment of conidia to free-living nematodes is promoted by strong adhesiveness, smallness, and slenderness, whereas the conidia of predacious forms must be large as they must produce extensive, strong mycelia. Of 21 interrelated Hyphomycetes preying on nematodes, all except two (capable of holding only feeble eelworms) produce a conspicuously differentiated predacious apparatus. The predacious Hyphomycetes show no apparent kinship with any parasitic fungus infecting eelworms by germinating spores.

Reviewing investigations in the United States on Dutch elm disease (*Ceratostomella ulmi*) [ibid., xv, p. 327; xix, p. 310], with special reference to host-parasite relationship, C. May (p. 520) states that in experimental inoculations the fungus effected invasion only through injuries reaching the cambium or xylem. Successful invasion resulted from inoculation of xylem of roots and stems, and petioles, midribs, and secondary leaf veins. Spores injected under water into spring water-conducting vessels near the base of trunks of large trees in full leaf spread 60 ft. in the sap stream in 1 to 2 hours. Upward and downward movement of spore suspension occurred simultaneously in vessels injected at breast height. The initial rate of upward movement was about 4 in. in $1\frac{1}{4}$ sec., but this was much reduced a few minutes after the pressure deficit was adjusted. Movement in summer-wood vessels was much slower. External symptoms sometimes developed seven days after inoculation. Small,

vigorously growing trees high in nitrogen became severely wilted after inoculation, and 93 per cent. of the stems died in six weeks, while trees low in nitrogen wilted slowly, though 73 per cent. of the stems died in one season. Mycelium was found to be only sparsely present in living elm tissues, and radial growth into new growth sheaths inducing self-reinfection was uncommon. Under natural conditions reinfection with the help of biological agencies is common. Recovery from outward symptoms partly depends on the weak penetrative powers of the fungus, which may live on for years in trees that appear to have recovered.

A. H. R. Buller (p. 534) discusses the occurrence and significance of flexuous hyphae in rust fungi. They are present in six genera of the Melampsoraceae, viz., *Coleosporium*, *Cronartium*, *Melampsora*, *Melampsorella*, *Milesia*, and *Pucciniastrum*, and in five of the Pucciniaceae, viz., *Gymnoconia*, *Gymnosporangium*, *Phragmidium*, *Puccinia*, and *Uromyces*.

F. L. Drayton (p. 537) points out that in the Ciborioideae and certain species of the form-genera *Botrytis* and *Sclerotium* microconidia on verticillate conidiophores function as spermatia in the fertilization of ascogonia, initiating apothecia. Irrespective of the conidial stages possessed by some of these fungi, three intergrading types of structural development are found. The first has a stroma, from which the ascogonium is elevated in a receptive body, on fertilization of which the apothecium is developed (*Ciboria* spp. and the brown rot fungi). The second resembles the first, but the stroma shows small sclerotia functioning as vegetative organs only (*Sclerotinia gladioli* and a new species from narcissus bulbs). The third group has sclerotia only, which function sexually and vegetatively: the ascogonia are not raised in receptive bodies before fertilization (*S. sclerotiorum*, *S. trifoliorum*, &c.).

P. H. Gregory (p. 539) describes a method for facilitating field observations on plant material naturally infected with *Botrytis* and investigating sclerotial germination out of doors. As a rule, *Botrytis* conidia are produced, but the connexion of a *S.* stage was established by single ascospore cultures with two *B.* spp. from *Narcissus* and one from *Anemone coronaria*.

Margaret Newton and T. Johnson (p. 544) state that, in nature, variation in *P. graminis* is largely confined to differences in pathogenic potentialities, though uredospore colour occasionally varies. Under laboratory conditions, crosses of *P. graminis* var. *tritici* with the varieties *secalis*, *avenae*, and *agrostidis* produced hybrid rusts differing from any known variety of *P. graminis*. Crosses between physiologic races of var. *tritici* produced many new races; certain pathogenic characters (infection types) were dominant over others, their distribution in F_2 and subsequent generations suggesting Mendelian inheritance. Other evidence indicated that cytoplasm also influences pathogenicity. In crosses between colour variants, normal uredospore colour resulted from the interaction of two pairs of Mendelian factors. Inbreeding of physiologic races gave abnormal rust characteristics, such as reduced vigour of sporulation, diminished pathogenicity, and loss of ability to produce aecidia, with limitation of ability to develop uredospores and teleutospores on barberry, on which some of the uredospores were uninucleate.

In the section dealing with the effects of micro-organisms and chemical substances on atypical growth in plants A. J. Riker (p. 546) adduces evidence which leads him to doubt whether there is a significant quantitative relation between growth substances observed on plants affected by crown gall and the causal organism (*Phytomonas* [*Bact.*] *tumefaciens*).

L. J. Havas (p. 549) describes the effects of animal hormones and vitamins on the incremental growth of crown gall. I. H. Baldwin (p. 553) states that attenuation of the cell-stimulating capacity of *Bact. tumefaciens* in tomato plants was effected in single-cell cultures by successive transfers in medium containing 0·2 to 0·3 per cent. glycerine. C. Stapp and E. Pfeil (p. 555) discuss the biochemistry of the crown gall tissue [ibid., xix, p. 201].

C. T. W. Hammarlund (p. 559) states that in extensive experiments he has obtained excellent control of barley loose and covered smuts (*Ustilago nuda* and *U. hordei*, respectively) and stripe disease (*Helminthosporium gramineum*), wheat loose smut (*U. tritici*), and oats loose smut (*U. avenae*) without any perceptible seed injury by vacuum treatment. The seed is evacuated for five minutes at 10 mm. mercury, and the disinfecting liquid, equally evacuated, is sucked into the reservoir, so that the seed is completely covered. The pressure is then restored to normal height, and the fungicide reaches and kills the hyphae. If the liquid is poured over the seed before evacuation, evacuation must be continued for at least 30 minutes.

T. E. Roemer, K. Isenbeck, and Hanna Becker (p. 563) state that the genotypic composition of four different populations of *Tilletia tritici* [*T. caries*] was considerably changed following 7 to 10 years' passages through four different wheat varieties [cf. ibid., xix, p. 79]. A strongly aggressive population remained unchanged after 10 years' passage, while a weak population became very aggressive after the same number of years. The virulence of populations which passed through resistant varieties during many years was retained when they were subsequently bred on susceptible ones. Passage for many years through susceptible hosts did not ensure the presence of all the original genotypes of *Tilletia* populations.

J. H. Swartz (p. 569) gives a detailed clinical description of two cases of extensive lichenified dermatitis caused by *Trichophyton rubrum* [ibid., xviii, p. 678]. The fungus lost its gross cultural characteristics and showed great variation in the production of microscopical characters; macroconidia were produced irregularly on Sabouraud's glucose medium, but abundantly on polished rice in flasks.

Ainsworth (G. C.). **The identification of certain viruses found infecting leguminous plants in Great Britain.**—*Ann. appl. Biol.*, xxvii, 2, pp. 218–226, 2 pl., 1940.

The following are among the points noted in this survey of virus diseases of leguminous plants in Great Britain. The virus of the English common bean mosaic was found not to differ essentially in its physical properties from bean virus 1 [*R.A.M.*, xiii, p. 488]. Outbreaks of common bean mosaic are stated to originate almost always from infected seed. From 7 to 20 per cent. of the seedlings raised in the glasshouse from infected seed showed symptoms of mosaic. The mosaic is fre-

quently found on the climbing varieties of *Phaseolus vulgaris* grown under glass, but it is not severe on the popular Guernsey Runner.

A disease closely resembling enation pea mosaic [ibid., xviii, p. 287], previously described only from the United States, is stated to occur commonly on sweet pea in south-eastern England; on culinary peas it was found only in one locality in Hertfordshire. The virus produces enations on the under sides of Alderman, Perfection, and The Lincoln peas, Harlington Windsor broad bean (*Vicia faba*), and sweet pea leaves. On the last-named host the first symptom is a prominent yellowing of the veins, followed by a rather characteristic yellow flecking of the leaves, enations, and slight deformation of the pods; the flowers are not broken, but occasionally infection has been associated with a few small rough lesions on the petals.

Viruses of the pea mosaic type were isolated from peas, sweet peas, broad beans, and red clover (*Trifolium pratense*) from numerous localities. One strain, which is widespread on peas and broad beans, and produces a very slight leaf mottle in sweet peas, causing severe flower break in coloured varieties, is stated to agree fairly closely with pea virus 2A [ibid., xvi, p. 583]. Another found naturally only in peas, causing a pronounced yellow mottle and stunting, shows similarities to pea virus 3 [ibid., xvi, p. 791].

Sweet pea streak, found to be invariably associated with virus infection, is thought to be a complex of virus diseases. One form of streak is due to a single virus which causes in sweet pea a well-defined clearing of the veins of the younger leaves, followed by a distinct but not very severe leaf mottle, brown, necrotic streaks on the stem and petioles, and breaking of the flowers. Sometimes the disease becomes more aggressive and kills the seedlings. To this virus (the physical properties of which are similar to those of pea mosaic) The Lincoln, but not Perfection pea, broad bean, French bean, and white clover (*T. repens*) are susceptible. It is suggested that while this virus is not identical with either bean virus 2, white sweet clover [*Melilotus alba*] mosaic virus, or the severe pea mosaic virus [ibid., xiii, p. 488; xvi, pp. 84, 650, respectively], it yet belongs to the same group.

Lettuce mosaic virus [ibid., xviii, p. 649], inoculated into sweet pea, gave rise after two or three weeks to small, brown lesions on the main stem, which may increase in size, and death of the shoot may follow. The new shoots either remain normal or become streaked. No definite leaf symptoms appear, although the virus was found to be present in all parts of the shoots; the flowers were not broken. Sweet pea plants received from one locality in Hertfordshire showed streak symptoms, and the causal virus proved to be of the cucumber virus 1 type, not previously observed on this host in this country. On inoculation into sweet pea seedlings severe streak symptoms developed after about 14 days and the plants died later.

A single sweet pea plant grown under glass was found to be infected with the virus of tomato spotted wilt [ibid., xvi, p. 321], this being a new British record. The diseased plant did not exhibit streak symptoms, but it was stunted and showed yellow spots or broad streaks on the leaves.

In protective inoculation experiments, peas infected with the mild strain of pea mosaic virus were resistant to the yellow strain, but a

plant showing symptoms of enation mosaic was susceptible to either of these strains. In the field, sweet peas were commonly found to be infected with both enation mosaic and common mosaic viruses. Sweet pea plants infected with lettuce mosaic could be infected with any of these viruses or with sweet pea streak virus. Bean mosaic virus did not protect French beans against the sweet pea streak virus, but there was a delay of about seven days in the appearance of symptoms due to the latter virus in pea plants previously inoculated with either the mild or yellow strains of pea mosaic.

WATSON (M[ARION] A.) & ROBERTS (F. M.). **Evidence against the hypothesis that certain plant viruses are transmitted mechanically by aphides.**—*Ann. appl. Biol.*, xxvii, 2, pp. 227–233, 1940.

In further experiments on the mode of transmission of persistent and non-persistent plant viruses by insects [*R.A.M.*, xix, p. 230], starved individuals of *Myzus persicae* after feeding for two minutes on infected plants successfully transmitted *Hyoscyamus* 3, potato Y, and severe etch viruses, all non-persistent in the vector, from tobacco to a number (up to 10) of successive healthy plants. With all three viruses aphids often failed to infect some healthy plants in the middle of a series, but infected later plants. When infective aphids were fed on two successive healthy plants the number of second plants infected decreased with increasing feeding time on the first healthy plant, none being infected after one hour. Infective aphids allowed short feeding periods on a succession of healthy plants gave infections in a series of nine consecutive healthy plants, while others fed continuously on one healthy plant for a corresponding total period failed to infect any of the second plants. These results are held to contradict the opinion that the non-persistent viruses are transferred mechanically through the cleansing of contaminated stylets of the infective aphids when feeding on a healthy plant. The hypothesis is advanced that the mechanism of transmission is not fundamentally different between the persistent and non-persistent viruses, but while the latter are inactivated by a secretion produced by the aphids during feeding, the former are resistant to it. A close specific relationship between the non-persistent viruses and insects with a particular type of physiology is postulated.

SCHOPFER (W. H.) & BLUMER (S.). **Étude comparative de la spécificité d'action de la pyrimidine, constituant de l'aneurine, facteur de croissance de microorganismes.** [A comparative study of the specificity of action of pyrimidin, a constituent of aneurin, a growth factor of micro-organisms.]—*Enzymologia*, viii, 4, pp. 261–264, 1940.

This is a detailed, tabulated account of studies at the Berne Botanical Institute on the specific action of pyrimidin, a constituent of aneurin (vitamin B1), on nine fungi of different groups, including *Polyporus adustus* [*R.A.M.*, xvii, p. 196; xviii, p. 335], *Phytophthora fagopyri* [ibid., xv, p. 102], and *Schizophyllum commune*. Pyrimidin was found to replace aneurin completely as an indispensable growth factor for *Polyporus adustus*, but was only a partial substitute in the case of *Phytophthora fagopyri* and *S. commune*.

Black (L. M.) & Price (W. C.). **The relationship between viruses of Potato calico and Alfalfa mosaic.**—*Phytopathology*, xxx, 5, pp. 444–447, 1 fig., 1940.

A comparative study was carried out at the Rockefeller Institute for Medical Research on the viruses of potato calico [*R.A.M.*, xix, p. 162] and lucerne mosaic [ibid., xv, p. 274], both of which were readily transferred by abrasion from diseased *Nicotiana glutinosa* to healthy plants of the same species after an incubation period of three to four days, as well as to Early Golden Cluster and Corbett Refugee beans (*Phaseolus vulgaris*), Black Eye cowpeas, broad beans (*Vicia faba*), Green Mountain potatoes, crimson, red, and white clovers (*Trifolium incarnatum*, *T. pratense*, and *T. repens*), and Improved Long Green cucumber. The viruses induced necrotic primary lesions on beans and cowpeas, sometimes developing within 24 hours on the former, mottling of white clover, the same accompanied by veinbanding in crimson and red clovers, and a bright yellow spotting of cucumber leaves. The symptoms caused by the potato calico virus were more severe on potato seedlings than those due to lucerne mosaic, whereas the latter was more injurious to *N. glutinosa* and crimson and red clovers. Under comparable conditions the potato calico virus produced fewer lesions in kidney and broad beans and cowpeas than did that of lucerne mosaic. These results were considered to indicate that the potato calico and lucerne mosaic viruses represented distinct strains of a single infective entity.

Cross-inoculation tests were made as follows. Groups of six young *N. glutinosa* plants were inoculated with each of the viruses responsible for lucerne mosaic, potato calico, potato ring spot, cucumber mosaic, and Canada streak [ibid., xix, p. 162], while juice from healthy *N. glutinosa* was rubbed over the leaves of a further six. Twelve days later, when the inoculated plants had contracted systemic infection, three upper leaves of three plants in each group were inoculated with juice from *N. glutinosa* infected by lucerne mosaic, the foliage of the three remaining plants being similarly rubbed with healthy *N. glutinosa* juice. After a fortnight, of the leaves rubbed with juice containing lucerne mosaic those previously inoculated either with this virus or potato calico were alive and green, while the others were dead or nearly so. Furthermore, the new foliage on the plants previously infected by these two viruses showed no symptoms beyond those typical of the chronic stages of the corresponding diseases, whereas systemic necrotic lesions characteristic of the acute phase of lucerne mosaic were shown by the fresh growth on the other plants. None of the control plants treated with healthy juice developed additional symptoms. In a similar experiment with Turkish tobacco, plants previously inoculated with potato calico did not contract necrotic primary lesions on subsequent inoculation with lucerne mosaic, whereas the leaves of healthy plants or those previously infected with cucumber mosaic were severely attacked.

On the basis of this evidence the potato calico virus is classified as a strain of lucerne mosaic to be designated *Marmor medicaginis* H[olmes] var. *solani* n. var., while lucerne mosaic itself should be known as *M. medicaginis* H[olmes] var. *typicum* n. var. [ibid., xix, p. 229].

Schlumberger (O.). **Kartoffelsortenprüfung auf Schorfwiderstandsfähigkeit 1939.** [Potato variety testing for scab resistance 1939.]—*Mitt. Landw., Berl.*, lv, 1, pp. 9–11, 1940.

Some of the recent outstanding contributions [all of which have been noticed in this *Review*] to the knowledge of potato scab [*Actinomyces scabies*] are briefly summarized in connexion with an account of the annual varietal reaction trials under the joint auspices of the Biological Institute and the Reich Food Board [*R.A.M.*, xvii, p. 483]. Of the varieties tested for the third year in succession, Carnea (v. Kameke) and Akebia (v. Kameke 46/902) [ibid., xix, p. 112] gave the best results, the former being to all intents and purposes immune and the latter semi-resistant. V. Kameke's 15/23 was the best of the second-year varieties, while of those entered for the first time the most promising were Knehden 2106 and 874, Lochow 31/201, Pfetten 39/39, and Nordost 38/31/6.

Excellent results in the control of the disease on the Sieglinde, Kaiserkrone, Prisca, and Sickingen varieties was obtained by soil disinfection with P_2 (I. G. Farben), used at the rate of 20 parts to 80 of superphosphate, the percentage (by weight) of healthy tubers ranging from 89·8 to 92·8 in the treated plots compared with 0 to 28·4 in the untreated [ibid., xviii, p. 545].

Jehle (R. A.). **Disease resistant Potato varieties in Maryland.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 20–26, [? 1940].

In seven years' tests carried out in Maryland in which the resistance to diseases of new potato varieties was tested against that of old standard varieties, no mild mosaic [crinkle] developed on Chippewa, Earlaine, Katahdin, Sebago, or Warba potatoes. Sequoia, reputed to be resistant to crinkle, developed less late blight [*Phytophthora infestans*] than the standard varieties, while Warba showed more leaf roll, late blight, and scab [*Actinomyces scabies*] than they did.

Wart-resistant varieties of Potato.—202 pp., 9 figs., Moscow, Selkhozgiz, 1938. Roub. 8. 40. [Abs. in *Plant Breed Abstr.*, x, 3, p. 254, 1940.]

In this manual, edited by S. M. Bukasoff and N. A. Naoumoff, the history and biology of *Synchytrium endobioticum*, the agent of wart disease of potatoes, are described, and the development of varieties resistant to the fungus traced from the first observations of Daine in 1908 to the present time.

Among the wild South American potatoes the following have shown resistance: *Solanum jamesii*, *S. commersonii*, *S. antipoviczii* var. *martinezii*, *S. ajuscoense*, *S. aracc papa* f. *brachikalukon*, *S. cathartum*, *S. edinense*, *S. molinae*, and *S. leptostigma*. Some forms of *S. demissum* have proved resistant, while others are susceptible, and the reaction of *S. palustre* is doubtful. Primitive cultivated species exhibiting resistance to wart disease include *S. stenotomum* var. *phiniu* f. *parvioculosum*, *S. ajanhuiri* formae *coloratum* and *viride*, *S. tenuifilamentum*, and *S. mamilliferum* f. *violacirubrum*. *S. andigenum* and the Chilean samples of *S. tuberosum* were also found to comprise a number of resistant forms.

Resistance was further observed in the following crosses: *S. demissum* with *S. andigenum* var. *quechuanum* and the commercial variety Znicz;

S. acaule×*S. rybinii*; triple hybrids obtained by crossing *S. goniocalyx*×*S. bukasovii* with other species, e.g., *S. rybinii*, *S. phureja*, and *S. ajanhuiri*, and with Wohltmann; the susceptible *S. curtilobum*×the susceptible Deodara, Świteź, and Centifolia and certain resistant varieties; *S. andigenum* var. *colombianum* f. *tocanum*×Epicure, Centifolia, and Jubel; f. *caiceda*×Centifolia; var. *quechuanum*×Centifolia and Weisse Riesen; f. *pacus*×Epicure, Gisevius, Weisse Riesen, and Świteź; var. *cuzcoense*×Centifolia; var. *herrerae*×Centifolia and Jubel; f. *ccompis*×*Centifolia*; and vars. *bolivianum* and *longibaccatum*×Centifolia and Cobbler, respectively.

A comprehensive, annotated list is given of existing wart-resistant varieties and data are presented on the yields of a number of those tested in different parts of the U.S.S.R.

The main characteristics of the South American species, including their reactions to *Synchytrium endobioticum*, are tabulated in a supplement to the monograph, which closes with a fairly complete bibliography.

Marchionatto (J. B.). **La 'Rhizoctonia solani' y la 'R. crocorum' en la República Argentina.** [*Rhizoctonia solani* and *R. crocorum* in the Argentine Republic.]—Reprinted from *J. agron., B. Aires, 1939*, 17 pp., 4 pl. (2 col.), 7 figs., 1940.

During 1937 the presence of *Helicobasidium purpureum* was detected for the first time in the Argentine on potatoes, where the crop is already known to be parasitized by *Corticium vagum* (*Rhizoctonia* [*C.*] *solani*) [*R.A.M.*, xv, p. 249]. The latter generally assumes the form of 'russet scab', 'jelly-end rot' and 'canker' being less frequent under local conditions. The following varieties were attacked by the fungus (in descending order of susceptibility): Alma, Brigitta, Up-to-Date, Majestic, Green Mountain, Rotweissragis, Early Rose, King Edward, Katahdin, and Chippewa. The perfect stage of the fungus has not yet been observed in the country.

The Katahdin tubers infected by *H. purpureum* [ibid., ix, p. 554; xiv, p. 730; xvii, p. 796] bore the characteristic mycelium and sclerotia [which are described]. The perfect stage has been found on lucerne in the Argentine but not on potatoes. Attempts to isolate the fungus were unsuccessful.

Samuel (G.). **Lightning injury to Potato tubers.**—*Ann. appl. Biol.*, xxvii, 2, pp. 196–198, 1 pl., 1940.

A field of Majestic potatoes in Holbeach Marsh, Lincolnshire, was struck by lightning in the summer of 1938. The tops of plants in the affected area showed a flattening and splitting of haulms and below ground the tubers were variously affected, showing deep or superficial burns. In some cases the whole of the central tissue was killed.

Rippel (A.). **Über die Verbreitung von Aspergillus niger, insbesondere in Deutschland.** [On the distribution of *Aspergillus niger*, especially in Germany.]—*Arch. Mikrobiol.*, xi, 1, pp. 1–32, 1940.

The addition of a high concentration (20 per cent.) of tannin to a synthetic nutrient medium was found in the writer's studies at Göttingen

University to facilitate the selective culture of *Aspergillus niger*, whereby the relative prevalence of the fungus in soils of different types and localities can be determined with a fair degree of accuracy.

The incidence of the organism was shown to increase from the north to the south of Germany, being more abundant, moreover, on southern than on northern slopes in a given area. It is also widespread in more southerly regions (Hungary), and in Tanganyika Territory, South-West Africa, South Africa, and Central America, though not absent from northern countries, e.g., Norway and Denmark. In Germany the distribution of *A. niger* roughly corresponds to that of the Mediterranean-Pontic forms among higher plants. Temperature, however, is not the only factor (though a decisive one) in the development of the fungus, which is also strongly influenced by the competitive activity of other soil organisms, notably the Mucorineae, these in turn being favoured by high acidity, low temperature, a plentiful moisture content, and so forth. The abundant occurrence of *A. niger* in dry lawns, meadows, vineyards, and pastures, as compared with forest and raw humus soils, is probably attributable to the scarcity of Mucorineae in the former.

About one-third of the numerous isolations under investigation (including some of the Norwegian strains) formed sclerotia on beer wort agar slants at 30° C. Strains from tropical soils, which at 30° produced a mycelium studded with sclerotia and totally devoid of spores, at 20° gave rise exclusively to spores, sclerotia being entirely absent. Sclerotia also failed to develop in cultures of indigenous strains at 20°.

NIETHAMMER (ANNELIESE). **Verhalten mikroskopischer Bodenpilze gegenüber in der Natur verbreiteten Wuchsstoffen.** [The reaction of microscopic soil fungi to widely distributed natural growth substances.]—*Arch. Mikrobiol.*, xi, 1, pp. 73–79, 1940.

A number of the soil fungi (including *Penicillium bicolor*, *Trichoderma koningi* [*T. viride*], and *Rhizopus nigricans*) previously isolated by the author from fruits and seeds at the German Technical College, Prague, Czechoslovakia [*R.A.M.*, xvii, p. 624] made poor growth in purified sugar solutions but throve on the addition to the nutrient medium of fragments of seed or fruit, organic acids (in tests with *P. expansum*, *Botrytis cinerea*, and *T. viride*), or rare elements (manganese, cobalt, and boron) contained in these organs (*P. expansum* and *T. viride*). Full details of the experiments are given.

GÄUMANN (E.). **Über die Wirtswahl des Uromyces graminis (Niessl) Dietel.** [On specialization in *Uromyces graminis* (Niessl) Dietel.] —*Ber. dtsch. bot Ges.*, lviii, 2, pp. 92–96, 1940.

Cross-inoculation experiments with overwintered teleutospores of *Uromyces graminis* [*R.A.M.*, xvii, p. 485] on *Melica ciliata* from Valais, Switzerland, on a large number of hosts revealed the existence of three physiologic races of the fungus, including f. sp. *mediterranea* Oliveira, with aecidia and pycnidia on *Coriandrum sativum*, *Foeniculum vulgare*, parsley, and various other plants.

ZUNDEL (G. L.), STEVENSON (J. A.), TUCKER (C. M.), WELCH (D. S.), & WEST (E.). **A note on the status of the generic name Urocystis.**—*Phytopathology*, xxx, 5, pp. 453–454, 1940.

Endorsing the decision of the Nomenclature and Plant Pathological Committees of the British Mycological Society [*R.A.M.*, xviii, p. 755], the American Committee on Fungus Nomenclature recommends the retention of the generic name *Urocystis* in preference to *Tuburcinia* pending a definite ruling by an International Botanical Congress.

ANDERSON (J. P.). **Notes on Alaskan rust fungi.**—*Bull. Torrey bot. Cl.*, lxvii, 5, pp. 413–416, 1940.

In this annotated list of 50 Alaskan rusts are included (in addition to species already mentioned from another source) *Uredinopsis struthiopteridis* [*R.A.M.*, xviii, p. 551] on *Athyrium cyclosorum*, *Phragmidium rubi-idaei* on *Rubus subarcticus* (Greene) Rydb. (*R. strigosus* Mich. in part) [ibid., xiii, p. 526], and *Puccinia coronata* on *Calamagrostis canadensis* [ibid., xvii, p. 737].

HOERNER (G. R.). **The species of the genus Pseudoperonospora and their recorded hosts.**—*Plant Dis. Reptr*, xxiv, 9, p. 170–173, 1940. [Mimeographed.]

Following up his recent studies on the nomenclatorial position of *Pseudoperonospora* [*R.A.M.*, xix, p. 435], the author lists the eight generally recognized species of the genus with their hosts, and appends a bibliography of the more important contributions (comprising 32 titles) to the subject.

VALLEAU (W. D.). **Sweet Clover, a probable host of Tobacco streak virus.**—*Phytopathology*, xxx, 5, pp. 438–440, 1940.

The occurrence of outbreaks of tobacco streak [*R.A.M.*, xix, p. 497] in the Burley variety growing in proximity to sweet clover (*Melilotus alba*), which is itself the host of a virus producing chlorosis and sometimes chlorotic or necrotic ring-and-line patterns, suggested the probable transmission of the disease from *M. alba* to tobacco. In 1937, 1938, and 1939 the percentages of streak in three small plots adjacent to second-year sweet clover at the Kentucky Agricultural Experiment Station were 16·6, 21·3, and 22, respectively, compared with only 0·12 among 13,650 plants in the remainder of the rotation series in 1939. Infection in tobacco coincides with the formation of the sweet clover seeds, at which juncture the hardening of the plants no doubt compels the insect vector to seek other hosts. Extensive plantings of sweet clover do not appear to constitute such a menace to adjacent tobacco crops as scattered roadside weeds, at any rate when left undisturbed by cutting or pasturing, the inference being that under these conditions the vector does not travel long distances.

WEST (J.). **The control of leaf curl of Tobacco in southern Nigeria.**—*Pap. Third W. Afr. agric. Conf., 1938* (Nigeria Sect.), i, pp. 205–206, [? 1940].

Practical control of tobacco leaf curl in southern Nigeria [*R.A.M.*, xvi, p. 131] may be effected in seasons of normal rainfall distribution by

late planting [see next abstract] to coincide with the gradual decline in the white fly (Aleyrodidae) [*Bemisia* sp.] vector population from the end of July onwards, supplemented by subsidiary sanitary measures, such as the destruction of all crop remains at the end of each season, of all 'volunteer' plants before the planting of the new crop, and of any plants developing leaf curl symptoms shortly after transplanting. In the establishment of nurseries it is wise to sow on three separate dates in order that a plentiful supply of vigorous seedlings may be available throughout the transplanting period of August and early September.

Shepherd (E. F. S). **Tobacco leaf curl.**—*Pap. Third W. Afr. agric. Conf., 1938* (Gold Coast Sect.), i, pp. 87–89, [? 1940].

Following a brief note on the symptoms of tobacco leaf curl [see preceding and next abstracts] and other abnormalities associated with the development of enations on the veins, the writer states that in the Gold Coast characteristics of the first-named disease are shown by *Acanthospermum hispidum*, *Malvastrum tricuspidatum*, and *Sida carpinifolia*. It will certainly be necessary to insist on the eradication of all mature tobacco plants from the vicinity of a plot to be planted with a new crop, while the removal of all wild hosts of the virus from the neighbourhood of tobacco seed-beds and plots should also assist in control. Seed of the Sterling variety, reported by H. H. Storey to show some resistance to leaf curl at the Amani Research Station, is being introduced into the Gold Coast for trial.

Deighton (F. C.). **Tobacco leaf curl in Sierra Leone.**—*Pap. Third W. Afr. agric. Conf., 1938* (Sierra Leone Sect.), i, pp. 7–8, [? 1940].

Leaf curl of tobacco [see preceding abstracts] appears to be widespread in Sierra Leone, where alternate hosts of the virus include *Sida carpinifolia*, *S. cordifolia*, *S. veronicaefolia*, *Stachytarpheta jamaicensis*, *Ageratum conyzoides*, *Acanthospermum hispidum*, *Synedrella nodiflora*, and *Scoparia dulcis*, while similar symptoms have also been observed at Njala on *Hibiscus esculentus* and the Malayan varieties of *Sesamum indicum*. Tobacco being of relatively slight importance in the colony at the moment, the problem of control does not immediately arise, but in the event of an extension of cultivation the encirclement of the crop by a planting of the densely growing *Digitaria exilis* to exclude the weed hosts of the virus might be considered.

Hopkins (J. C. F.). **The Tobacco 'kromnek' virus in Rhodesia.**—*Rhod. agric. J.*, xxxvii, 6, pp. 326–329, 2 pl., 1940.

Attention is drawn to the recent detection, in the Bulawayo and Salisbury districts of Southern Rhodesia, of 'kromnek' [spotted wilt] symptoms on *Dahlia*, nasturtium [*Tropaeolum majus*: *R.A.M.*, xvii, p. 141], and tomato, necessitating the adoption of appropriate legislative measures to combat this menace to the tobacco crop [see below, p. 576]. On *Dahlia* the symptoms consist of diamond, concentric ring, and wavy line patterns, yellowish at first, later turning brown or white, on the leaves; sometimes the lines follow the outlines of the veins and produce a 'fernleaf' appearance. On nasturtium also the pale green, yellowish, or whitish areas follow the veins, or dark and pale green

mottling may develop. Under local conditions the most likely method of spread is by means of tubers, bulbs, cuttings, and seedlings; the spotted wilt virus not being transmissible through the seed, new *Dahlia* plantings should preferably be raised from seed rather than by vegetative propagation.

GREEVES-CARPENTER (C. F.). **A blight resistant Chestnut.**—*Sci. Amer.*, clxi, 2, p. 93, 1 fig., 1939.

One of the crosses made between the American chestnut and *Castanea mollissima* introduced from China by the Department of Agriculture in the hope of checking the ravages of blight [*Endothia parasitica*: *R.A.M.*, xix, p. 442] is stated to have grown for 20 years at the Bartlett Tree Research Laboratories and to have fruited for several, the nut being similar to that of the American parent in size, quality, and sweetness. Over 1,000 one-year-old seedlings of this successful cross have been distributed to commercial growers in different parts of the country. The probability of a rehabilitation of the native chestnut in the areas of original invasion of the blight is considered to be remote.

WHETZEL (H. H.). **Sclerotinia bifrons.**—*Mycologia*, xxxii, 1, pp. 124–127, 1940.

A Latin diagnosis is given of *Sclerotinia bifrons* n. sp., the perfect stage of *Sclerotium bifrons* Ell. & Ev., a frequently serious foliar pathogen of aspen [see next abstract], which is stated to have been prevalent in the Ithaca district of New York nearly every spring since 1921, arising from sclerotia fallen to the ground from infected leaves. The apothecia, occurring singly, or occasionally in twos or threes, are broadly infundibuliform to patelliform, 2 to 10 mm. in diameter, 'Saccardo umber' or dark cinnamon, Natal brown at maturity, with thick stipes, 5 to 25 mm. in length; the asci, 152 to 200 by 9 to 12 μ, contain eight obliquely uniseriate, unicellular, broadly ovoid, hyaline, biguttulate ascospores, 11 to 16 by 4 to 7 μ. The fungus described as *Sclerotinia bifrons* by Seaver and Shope from Colorado (*Mycologia*, xxii, pp. 1–8, 1930) has been critically studied by the author and found to be quite distinct from the foregoing and the name *S. confundens* n.sp. is accordingly proposed for it.

[In an editorial note appended to this paper, F. J. Seaver maintains that the name *S. bifrons* Whetzel, representing a later homonym of *S. bifrons* Seaver & Shope, infringes Article 61 of the International Rules of Botanical Nomenclature: he therefore proposes its replacement by *S. whetzelii* Seaver.]

POMERLEAU (R.). **Studies on the ink-spot disease of Poplar.**—*Canad. J. Res.*, Sect. C, xviii, 5, pp. 199–214, 1 pl., 1 fig., 1 diag., 1 graph, 1940.

The ink spot disease of aspen caused by the fungus, *Sclerotinia bifrons* Whetzel [*S. whetzelii* Seaver, see preceding abstract], is stated to be distributed throughout the whole temperate region of the North American continent, attacking chiefly *Populus tremuloides*, but also occasionally *P. nigra*, *P. grandidentata*, and *P. canadensis*. Generally the disease is not very injurious to the trees, but under favourable conditions serious outbreaks may occur. The severe attack lasting from 1935 to 1937, during which the present studies were conducted, caused intense defoliation

and in many cases death of young trees. The sclerotia of the fungus overwinter on the ground; the apothecia are formed fairly early in the spring and, as they become mature, the spores are discharged violently into the air and disseminated by the wind. Attempts to obtain fructifications artificially from sclerotia collected before the winter failed, whereas those allowed to overwinter under the snow fruited abundantly when exposed to a temperature slightly above freezing point, indicating the importance of low temperatures for the formation of fruit bodies. It appears that in nature excessive moisture is necessary to bring about the ejection of ascospores. The spores germinated readily in water, but the development of mycelium was scarce on a medium other than poplar leaves. Infection is easily obtained artificially in the laboratory. In nature, the first symptoms of the disease, appearing about a month after the opening of the buds, consist in more or less extensive, circular or irregular spots, clearly demarcated by a reddish or dark brown discoloration, which may very rapidly cover the entire leaf. The growth of the mycelium in the leaf tissue is generally very rapid; it is inhibited by rising temperatures. The sclerotia arise on small, circular, translucent spots, which usually appear after a few days of rain; after their appearance the remaining portion of the leaf becomes slightly distorted. The sclerotia mature rapidly, in from 15 days to a month, provided abundant moisture is present, and fall to the ground. The disease is especially severe in dense stands of young trees with the foliage not too far from the ground. Generally only young trees are killed even in severe outbreaks, the older ones surviving infection. For an epiphytotic development of the disease the following conditions are essential: the presence of fairly large numbers of sclerotia on the ground, the occurrence of dense stands of young trees, and the prevalence of low temperatures and high degrees of moisture during foliation. Since these conditions rarely coincide and under normal conditions the effects of the fungus are rather mild, the disease is not considered to be of great importance.

Caroselli (N.) & Howard (F. L.). **Bleeding canker of Maples.**—*Bull. Bartlett Tree Res. Lab.* 3, pp. 44–48, 3 figs., 1939. [Received July, 1940.]

Ornamental maples (*Acer saccharum*, *A. nigrum*, *A. saccharinum*, *A. rubrum*, *A. pseudoplatanus*, and *A. platanoides*) in Rhode Island and the neighbouring areas of eastern Massachusetts are stated to have sustained severe damage of recent years from bleeding canker (*Phytophthora cactorum*) [*R.A.M.*, xvii, p. 713], the first record of which in the locality dates from 1930.

The bark of the trunk and scaffold branches of affected trees bear indefinite cankers, tending to develop vertically rather than laterally, and imparting a furrowed appearance to the smooth cortex of young maples. An exudate resembling dried blood issues from cracks in the cankered bark. Infection progresses most actively in undisturbed trees in moist situations; the rate of advance of the pathogen is accelerated by increased sap flow, so that any factors contributing to succulent growth should be eliminated. The upward movement of the cankers suggests that the primary seat of infection is in the roots.

Chronic and acute secondary symptoms can be differentiated. The former consist of a reduction in the size and number of the leaves and their yellowish-green coloration, accompanied by a progressive die-back of the branches, on older, slowly growing trees; Norway maples generally suffer chiefly from top die-back, while scanty foliage is more characteristic of the sycamore type. Abnormally copious fruit production is another symptom of chronic infection, which may extend over a period of several years before killing the trees. In acute cases, the trees succumb after one to three years. The symptoms are characterized by death of the cambium, giving a furrowed appearance to the trunk, the interior of which (in 15-year-old Norway maples) was found on cross-sectioning to contain reddish-brown necrotic areas, with well-marked, olive-green margins, the latter penetrating deeply into the wood. The discolorations were traced down to the roots, the exterior of which was normal, and their vertical course through the sapwood to the branches was interrupted by irregular lysigenous cavities, sometimes emitting forceful spurts of a reddish-brown, watery fluid in response to blows on the bark.

In greenhouse inoculation tests isolates of *P. cactorum* from maple were pathogenic to tomato, potato, pepper [*Capsicum annum*], eggplant, apple, and pear.

Demaree (J. B.), Cole (J. R.), Parson (H. E.), & Large (J. R.). **Diseases of the Pecan.** *ex* **Insects and diseases of the Pecan and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1829, pp. 36–70, 21 figs., 1940.

This bulletin (superseding No. 1672 of the same series [*R.A.M.*, xi, p. 213]) presents in a popular form the available knowledge concerning pecan diseases and their control in the United States, where the importance of scab (*Cladosporium effusum*) is stated to be increasing year by year, the wide dissemination of the different physiologic races of the fungus involving a large number of varieties. In some localities in the southern range of distribution of the tree, downy spot (*Mycosphaerella* (*Cercosporella*) *carygena*) [loc. cit.], vein spot (*Gnomonia nerviseda* Cole), leaf blotch (*M. dendroides*), brown leaf spot (*Cercospora fusca*), and liver spot (*G. caryae* Wolf var. *pecanae* Cole) cause serious damage to the foliage. Generally speaking, notwithstanding the introduction of progressive methods in orchard planting, the earlier known pecan diseases, with the possible exception of rosette [ibid., xvi, p. 717], are more severe than formerly, contributory factors in the enhanced pathogenicity of the causal organisms, besides their wider extension, being the debility of the trees from crowding and neglect in earlier years.

The resemblance of vein spot to scab lesions on the leaves is so close that the two diseases are readily confused, the spots produced by both pathogens originating in the veins and turning dark brown to black in the final stages. *G. nerviseda* forms two kinds of lesions, those developing on the very small veins being circular or oval and seldom exceeding $\frac{1}{4}$ in. in diameter, while the larger veins and petioles bear long, narrow discolorations, sometimes extending from the base to the apex of a leaflet. The leaf tissues on either side of the veins are not extensively

invaded. Severe attacks on the petioles may either cause wholesale premature defoliation or girdling of the petioles, in which case the dead leaflets adhere to the tree for a time. The Van Deman, Frotscher, and Stuart varieties are particularly subject to infection by *G. nerviseda*, the life-history of which is similar to that of most other fungal parasites of pecan foliage, overwintering taking place on the fallen leaves, with spore formation in the early spring and inoculation of the new leaves in April. Good commercial control of vein spot can usually be obtained by one pre-pollination treatment with Bordeaux mixture 4–1–100 and one or two subsequent applications of the same preparation at 6–2–100, the first shortly after pollination and the second three weeks later. Scab may be similarly combated [ibid., xvi, p. 426], with the addition of a fourth spray (Bordeaux 6–2–100) three weeks after the foregoing.

The first symptoms of liver spot appear in May and June as dark brown, circular spots $\frac{1}{8}$ to $\frac{3}{8}$ in. in diameter, on the lower surface of the leaflets, mainly along each side of the midrib. In September and October the colour of the lesions changes to cinnamon-brown and the dark fructifications of the fungus develop in the centre. Extensive premature defoliation may occur at this time in severe cases of infection by *G. caryae* var. *pecanae*, good control of which is given by one application, preferably after the middle of May, of 6–2–100 Bordeaux mixture.

G. dispora Demaree & Cole, the agent of long, narrow, nearly black, necrotic areas, $\frac{1}{2}$ in. or more in diameter, between the lateral veinlets, has so far been found only on rosetted trees, suggesting that the fungus is a weak parasite.

Chambers (E. L.) & Kouba (T. F.). **White Pine blister rust in Wisconsin.**—*Bull. Wis. Dep. Agric.* 204, pp. 37–48, 6 figs., 1939.

A brief, popular account is given of white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*: *R.A.M.*, xix, p. 314] and its control in Wisconsin, where in January, 1939, infection was observed on pine or *Ribes* in 69 counties, virtually covering the entire State.

Lyon (E. D.). **Machine shave, sterilize, sapwood to stop Cedar pole sap rot.**—*Elect. World, N.Y.*, News Issue, cxii, 6, pp. 43–44, 103, 3 figs., 1939.

Although modern creosote treatments, giving $\frac{1}{2}$ in. penetration, have preserved western red cedar [*Thuja plicata*] butts for a service life of 35 years, sapwood rot [unspecified], largely concealed by an outer shell of sound wood, frequently cuts the duration of the above-ground portions of telegraph poles far below this figure. Out of 535 poles treated with linseed oil paint, 48·4 per cent. showed some degree of sapwood decay above soil-level, their average life being 13 years. Poles with thick sapwood having proved most susceptible to rotting, the Commonwealth Edison Company has adopted the practice of shaving it down to less than $\frac{1}{2}$ in., followed by 15 minutes' immersion in creosote at 170° to 180° F. An electrically driven high-speed shaver is used, the average time for the treatment of a 35-ft. to 60-ft. pole being about six minutes.

FINDLAY (W. P. K.). **Douglas Fir and Baltic Redwood. The conclusions drawn from tests on their resistance to decay.**—*Timb. Tr. J.*, clii, 3311, pp. 323–324, 1940.

Small test pieces of the heartwood of Douglas fir (*Pseudotsuga taxifolia*) from six localities in Canada and of Baltic redwood (*Pinus sylvestris*) from six localities in Sweden, Poland, Finland, and the U.S.S.R. were sterilized by heating, weighed under aseptic conditions, and placed on pure cultures of *Merulius lacrymans*, *Coniophora cerebella* [*C. puteana*], *Poria vaillantii*, *Lentinus lepideus*, and *P. xantha* [ibid., xviii, pp. 76, 362] in special culture flasks, kept at 22° C., water being added to maintain optimum humidity. Twenty test pieces from each of the two lots were exposed to each fungus, and the losses of weight due to fungal attack after four months were averaged.

The [tabulated] results showed that in the Canadian material the average percentage losses in dry weight due to the fungi were, respectively, 6·8, 4·9, 4·0, 4·1, and 10·3 (grand average 6), the corresponding figures for *P. sylvestris* being 6·9, 8·4, 8·8, 23·0, and 24·9 (grand average 14). No great difference in resistance was shown between the samples of *Pseudotsuga taxifolia* from the different parts of Canada, nor was there any direct correlation between rate of growth (as indicated by specific gravity) and resistance to decay. With *Pinus sylvestris* only slight differences in resistance to decay were noted as between the samples from the different countries, indicating that resistance is not closely associated with growth rate. Both woods were about equally resistant to *M. lacrymans*, but *Pseudotsuga taxifolia* was much more resistant than *Pinus sylvestris* to the other fungi. This was especially striking in the case of *L. lepideus*. As this fungus is the chief cause of decay in imperfectly creosoted railway sleepers [ibid., xviii, p. 829], attention is drawn to the resistance of Douglas fir (difficult to impregnate with creosote) to it.

FINDLAY (W. P. K.). **Sap stain. More about its prevention by the use of chemical dips.**—*Timb. Tr. J.*, cliii, 3326, pp. 413, 415, 1940.

In this paper the author briefly discusses some of the precautions that should be taken to prevent the development of sap stain in felled sawn-up timber [*R.A.M.*, xviii, p. 364]. If the logs cannot immediately be converted, the ends and any damaged parts of the bark should be coated with a waterproof paint containing an antiseptic. If a log pond is available the best way to prevent all forms of 'degrade' is to store the logs under water. Dipping, to be effective, must be carried out immediately after sawing. In large mills a permanent dipping vat should be installed, and the timber should be conveyed by means of conveyor chains directly from the saw to the vat, in which it should remain submerged for 15 seconds. In small mills the timber may be hand-dipped, the workmen being provided with rubber gauntlets and aprons. The dipping vat may consist of a narrow wooden trough big enough to take the largest boards. If a portable tank is used it should, for convenience in handling, be about 14 ft. long, and provided with a draining board. A separate 50-gallon covered tank should be used to mix the solution, which is run into the treating vat as required. Treated timber should not be left in solid piles for more than a few days before being piled to

season, but should be stacked openly as soon as possible, under cover of a roof. With mechanically operated vats the cost of solution to dip 1,000 bd. ft. of pine (about 10 gals.) amounts to between 1*s.* and 1*s.* 6*d.* (pre-war), while with hand-dipping, reckoning labour at 8*s.* a day, the cost of dipping 1,000 bd. ft. (including price of solution) is about 2*s.* 6*d.*

SCHEFFER (T. C.) & LINDGREN (R. M.). **Stains of sapwood and sapwood products and their control.**—*Tech. Bull. U.S. Dep. Agric.* 714, 124 pp., 9 pl., 4 figs., 12 graphs, 1940.

In the Gulf States and the lower Mississippi Valley, where high temperatures and abundant rainfall prevail during most of the year, staining [*R.A.M.*, xviii, p. 363; cf. also ibid., xix, p. 57] presents a very serious problem. In mountainous and more northerly parts of the United States, characterized by lower winter temperatures and greater variation in moisture conditions, blue staining is markedly seasonal. Outside the southern States, the condition is most troublesome in the Californian pine area, and in the vicinity of northern Idaho.

Materials which, at tested concentrations, most effectively controlled stain in both pine and hardwood lumber, were a number of organic mercury compounds, sodium pentachlorophenolate, and a mixture of sodium tetrachlorophenolate and sodium 2-chloro-ortho-phenolate. Commercial soda and ammonium fluoride were effective on pine alone. Borax, certain compounds with the borate radical, and sodium tetrachlorophenolate were most effective on hardwoods only. It is suggested that there may be a differential tolerance of pine and hardwood fungi to the treatments in question.

Of the chemicals tested by the authors and now extensively used, lignasan, dowicide P, santobrite, and dowicide G may be used on softwoods and hardwood, while dowicide H may be used on almost all species except southern pines in localities immediately adjacent to the Gulf of Mexico.

For satisfactory results with any dipping or spraying treatment stain-free logs, prompt treatment, thorough coverage, adequate concentration of the chemical, protection from rain of the treating solution and the treated stock, and good seasoning practices are necessary. The data obtained indicated that, generally, treatment cannot safely be deferred longer than 24, or at most 48, hours. The concentration of the solution used should never be lower than that recommended, and in unfavourable weather may sometimes advantageously be increased.

Chemical treatments can be successfully carried out in small as well as large mills. Treated lumber can in some cases be bulk-piled for four weeks without the development of objectionable stain. In the absence of serious insect attack, satisfactory stain control in unsawn logs has been obtained for storage periods as long as 90 to 120 days by spraying the ends and barked areas. The concentrations used should generally be four to six times as high as those used for sawn logs.

B[IRCH] (T. C.). **A note on the production of creosoted fence posts by the State Forest Service.**—*N.Z.J. For.*, iv, 4, p. 257, 1 pl., 1939.

A description is given of non-pressure creosoting plants which are being established in New Zealand. The process adopted consists in immersing the barked and seasoned fence posts in creosote at 180° to

200° F. for a period that varies with the species treated, and then discharging the hot creosote and refilling the tanks with cool creosote. This 'hot and cold' process [*R.A.M.*, xv, p. 332] gives a similar penetration and absorption to that given by the pressure process. The evidence indicates that treated posts have an average service life of not less than 20 years.

Cox (T. R.). **Relation of boron to heart rot in the Sugar Beet.**—*J. Amer. Soc. Agron.*, xxxii, 5, pp. 354–370, 3 figs., 1940.

Sugar beet seedlings grown at the Michigan Agricultural Experiment Station [*R.A.M.*, xviii, pp. 76, 77] in quartz sand cultures with a nutrient solution devoid of borax developed symptoms of heart rot, which did not appear until two months after the seedlings were transplanted, owing to the available boron in the sand and seed.

The root yield was increased by up to 80 per cent. by four applications of borax at the rate of 11·9 mg. per 5 kg. sand, while definite recovery ensued when severely diseased seedlings were supplied with 4·9 mg. per pot. Halves of field-grown mother beets planted in quartz sand cultures without borax produced stunted leaves with marked symptoms of boron starvation, whereas those receiving added boron at the rate of 2 mg. per gal. pot developed more luxuriant foliage free from signs of deficiency.

Tests for available boron showed that a sugar beet crop produced in pot cultures removes a substantial quantity of boron from the soil, the following amounts, reckoned in mg. and averaged from four pots, having been detected in 25 gm. samples of soil: untreated and uncropped, 0·065; untreated, after two crops, 0·053; borax 76 mg. per pot, after one and two crops, 0·094 and 0·067, respectively; borax 304 mg. per pot, after one and two crops, 0·216 and 0·172, respectively. It was found to be relatively easy to remove added borax from soils by leaching with distilled water even as long as 14 months after application.

Warington (Katherine). **The growth and anatomical structure of the Carrot (Daucus carota) as affected by boron deficiency.**—*Ann. appl. Biol.*, xxvii, 2, pp. 176–183, 2 pl., 7 figs., 1940.

In a study conducted at Rothamsted in 1937, carrots grown in nutrient solutions containing no boron exhibited both external and internal symptoms of deficiency and eventually died, whereas the addition, renewed regularly, of boric acid within the range 1 part in 2,000,000 to 50,000 of culture solution resulted in perfectly healthy growth. The chief external symptoms of deficiency were as follows: the leaves curled back, pointed downwards, and often turned red or yellow; the laminae of the youngest leaves were much reduced and the growing apex of the shoot died; the flowering stage was not reached; and a small tap-root was formed, but the laterals were short and thickened in places. Certain additional symptoms appeared in late stages of growth in plants which had received an initial supply of boron, but were later transferred to a boron-free solution: the flowering heads bent over and died, those of the side shoots being the first to succumb, and in some cases small, wart-like excrescences developed on the outside of the tap-root. Details are given of the effect of boron deficiency on the tissues of the shoot and root.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 4, pp. 81–84, 1940.

BELGIUM. A Ministerial Decree of 9th February, 1940, provides for the immediate notification of the burgomaster of a commune of any case of potato wart (*Synchytrium endobioticum*) in growing crops or stocks [*R.A.M.*, vii, p. 752]. Tubers and haulms of infected plants harvested within a radius of 2·5 m. of the focus of disease are to be collected and burnt *in situ* or buried under a cover of lime and soil at least 50 cm. in depth. The haulms of plants harvested elsewhere in the infected field are also to be burnt on the spot. The minimum area to be considered as infected will be decided by an inspector of the Phytopathological Service, without whose authorization no tubers may be lifted or transported. Material for which such a permit is granted may be used only after boiling. Potato cultivation must be suspended for seven years in areas declared to be wart-infected, except in the case of immune varieties, the growing of which may be resumed after the third year. Similar restrictions apply over a radius of 500 m. from foci of infection, except that here the cultivation of immune varieties may recommence after the first year. A written permit is required for the removal of manure from infected to other farms.

KENYA. Government Notice No. 551 of 28th July, 1939, empowers the Governor to prohibit the movement within the Colony of any plant or seed in a diseased condition or likely to spread disease and the cultivation of any crop liable to impede the proper control of a disease or pest. In any area where diseases cannot be controlled or eradicated he may declare such area to be infected and the movement of specified plants from such areas will be permitted only by special authorization.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 5, p. 102, 1940.

GERMANY. A Circular of 3rd October, 1939 (cited in the official plant protection regulations [*Beil. Nachr Bl. dtsch. PflSchDienst*], xii, 1, pp. 2–4, 1940) advocates restrictions on the cultivation of Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] with a view to limiting the spread of *Adelopus* [*Phaeocryptopus gaeumanni*: *R.A.M.*, xviii, p. 425; xix, p. 506]. The disease caused by the latter is particularly serious in south Germany and has not yet been observed in the north. Seeds and saplings of southern origin should therefore not be supplied to northern foresters.

Dahlias and 'kromnek'.—*Rhod. agric. J.*, xxxvii, 6, pp. 318–319, 1940.

Government Notice No. 162 of 1940 prohibits the introduction into Southern Rhodesia of any *Dahlia* plants or tubers from the Union of South Africa, where the majority are believed to be infected by the 'kromnek' [spotted wilt] virus of tobacco [*R.A.M.*, xviii, p. 112]. Government Notice No. 236 of 1940 declares the aforesaid virus to be a pest within the meaning of the Tobacco Pest Suppression Act, 1933 [ibid., xii, p. 736], and specifies *Dahlia* as an alternate host [see above, p. 568], liable to destruction in cases of actual or suspected infection at the discretion of an authorized inspector. Similar powers (including the right of quarantine) may be exercised in registered nurseries by virtue of Government Notice No. 237 of 1940.